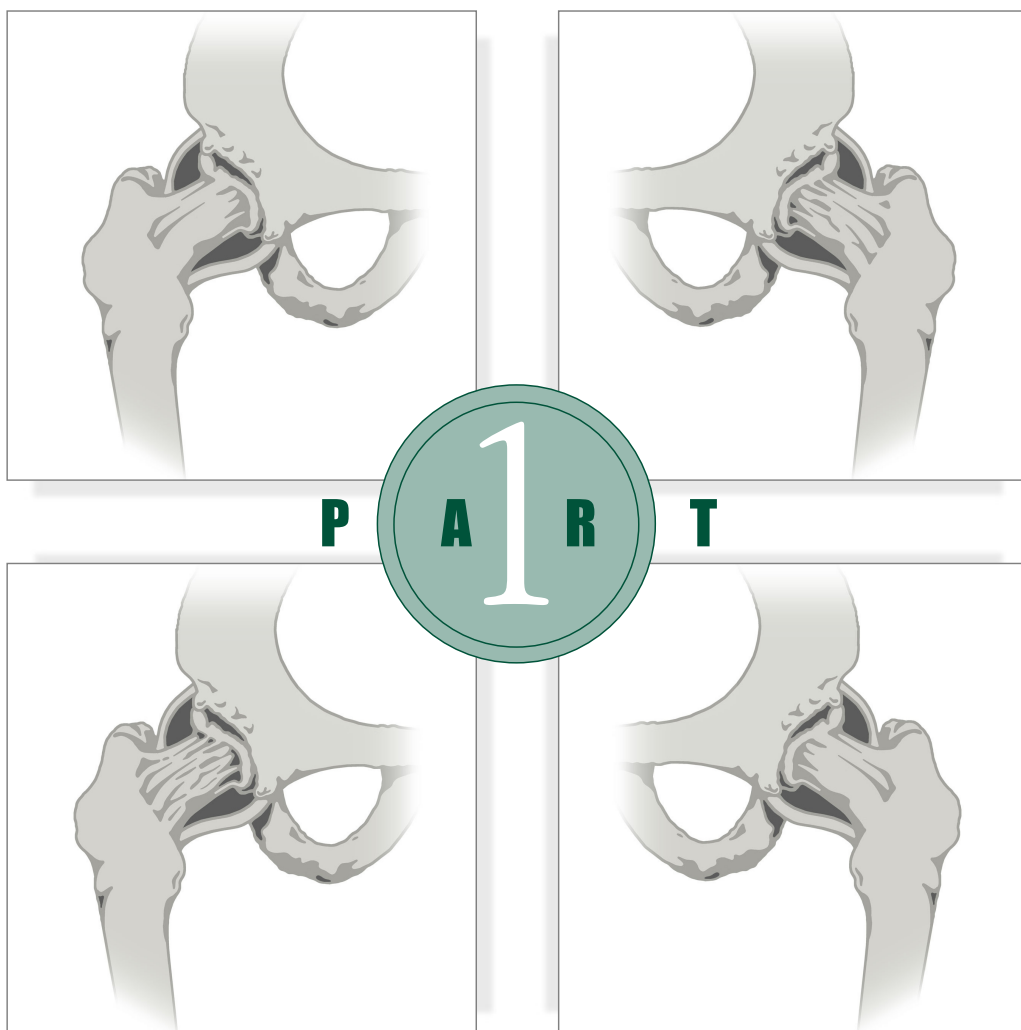

OSTEOPOROSIS: THE ERA OF THE BISPHOSPHONATES



THIS ACTIVITY IS ALSO AVAILABLE AT OUR WEBSITE: WWW.VCU-CME.ORG

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Felicia Cosman, M.D.:
Grant/research support: Wyeth-Ayerst
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VCU designates this educational activity for a
maximum of 1 hour in category 1 credit toward
the AMA Physician's Recognition Award. Each
physician should claim only those hours of
credit that he/she actually spent in the educa-
tional activity.

This educational activity was planned in
accordance with Accreditation Council for
Continuing Medical Education (ACCME)
Essentials and Standards.

Statement of Educational Need

This activity is designed to respond to the needs
of endocrinologists and other physicians who
treat patients with osteoporosis, by updating
their knowledge of the epidemiology, diagnosis,
and treatment of the disease, with an emphasis
on the bisphosphonates, which are the most
potent available drugs for the treatment of
osteoporosis.

Educational Objectives

After reading this monograph, listening to
the audio CD, and completing the post-test,
the participant should be able to:

- Describe the epidemiology and impact of
osteoporosis
- Describe available diagnostic guidelines and
techniques
- Better understand the modes of action and
relative effectiveness of the various agents
used to treat osteoporosis
- Choose the appropriate treatment
modalities for patients newly diagnosed
with osteoporosis

Statement of Educational Method

The educational information is presented in
a 12-page monograph and an accompanying
25-minute audio CD.

Statement of Evaluation Instrument

A 12-question multiple-choice post-test is used
as the evaluation instrument. An activity evalu-
ation questionnaire will be completed by each
participant.

Statement of Intended, or Target, Audience

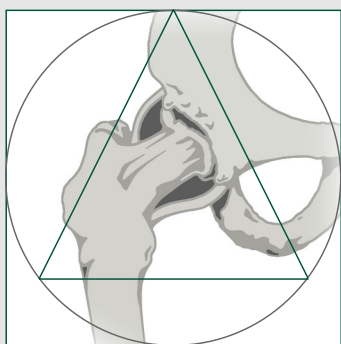
This activity is intended for, but not limited to:
endocrinologists and other physicians who care
for patients with osteoporosis.

Instructions

To earn 1 hour of category 1 credit, listen to the
accompanying CD and read the material in this
monograph carefully. Complete the activity
evaluation and answer the post-test questions
on the accompanying questionnaire. Send the
questionnaire in the enclosed envelope to:
OCME REGISTRAR, P.O. Box 980048,
Richmond, VA 23298-0048. ATTN: OSTEO
PROGRAM. Your credit certificate will be
returned. Participation is confidential.
Estimated program completion time: 1 hour.

Activity Number: END 00 09 102 02
Release date: 09-01-02. Expiration date: 08-31-04.

Supported by an unrestricted educational grant
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Epidemiology and impact

Osteoporosis is a disease characterized by a reduction in the quantity of bone tissue and a deterioration of the structure or microarchitecture of bone tissue, both of which produce bone fragility and an increase in the risk of fractures throughout the body.

Osteoporosis is very common; it currently affects 4-6 million postmenopausal Caucasian women.¹ Approximately half of all Caucasian women will experience an osteoporotic fracture during their lifetimes. In the United States, there are approximately 1.5 million osteoporotic fractures every year.² Of these, 250,000 are hip fractures, which carry a 24% mortality risk within the first year.³ About one in six Caucasian women will fracture her hip.^{4,7} Half of those who suffer hip fractures are unable to walk without assistance² and about 8% require long-term nursing care.⁸ Only 10-15% will return to full, independent activity.

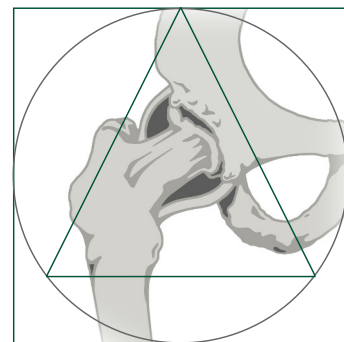
Osteoporosis presents an enormous burden to the healthcare system. The cost of the disease and its associated fractures is estimated to be \$14 billion annually. Hip fractures incur the greatest expenditures. Initial hospital care costs an average of \$7,000 and the average cost for the first year post-fracture is \$21,000. In 1995, hip-fracture treatment costs totalled \$8.68 billion.⁹

Vertebral fractures are associated with an increase in mortality that is directly related to the number of fractures as documented on x-ray. Vertebral fractures also have major physical consequences, including loss of height, changes in posture, chronic back pain, difficulty breathing and the so-called Dowager's hump. People with fractures in the lumbar region may experience changes in the abdominal anatomy, abdominal pain, constipation, reduction in appetite, and a feeling of fullness and distension. These changes can have a major negative impact on a patient's quality of life.¹⁰⁻¹² The cumulative burdens of pain, disability, reduced quality of life, and cost represent a serious public health problem.

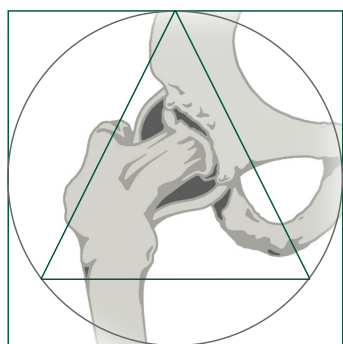
Risk Factors

During childhood, bone is gained in a relatively linear fashion. At puberty there is a major acceleration in bone acquisition, with a dramatic increase in bone mineral density (BMD). This increase in BMD represents an increase in the dimensions of bone rather than a change in the density of existing bone matrix. In females, the bone acquisition process is nearly complete by age 17; in males by age 20. Maximum BMD is achieved around age 28.

Genetic factors are largely responsible for determining the level of peak bone mass. Nutritional factors (e.g., calcium intake), exercise patterns, age of menarche, regularity of menstrual function, and exposure to alcohol and tobacco also affect peak bone mass. At the time of menopause, all women lose bone. This bone loss is accelerated in the first five years after menopause but continues through the rest of life. Several factors can increase



The cost of osteoporosis and its associated fractures is estimated to be \$14 billion annually.



or decrease the rate of bone loss at this stage of life, including exercise, calcium and vitamin D intake, and smoking. A variety of diseases, such as inflammatory bowel disease, multiple myeloma, lupus, and rheumatoid arthritis, can contribute to bone loss. Certain medications, such as glucocorticoids and excessive amounts of thyroid hormone, can also increase bone loss.

Compared with men, women are at higher risk for osteoporosis because of a lower peak bone mass, smaller skeletal size, and the accelerated bone loss that occurs after menopause. Among women, the incidence of osteoporotic fractures is higher in Caucasians than in African-Americans, while women of Hispanic descent have an intermediate risk. There is greater variability within each race, however, than there is among races.

Men have a lower risk for osteoporotic fractures, but the lifetime risk is still substantial — 25% for a 60-year-old man. As with women, the risk of hip fracture rises exponentially with aging, but the age at which this increase begins is typically five to 10 years later in men.

Diagnosis

The diagnosis of osteoporosis requires the assessment of risk factors, measurement of bone mineral density, documentation of fractures, and an evaluation of potential secondary causes of bone loss. The National Osteoporosis Foundation (NOF) recommends that all postmenopausal women age 65 or older have a bone mineral density test regardless of any other risk factors or therapies being used at the time (Table 1). The Foundation also recommends that postmenopausal women under the age of 65 who have one or more additional risk factors for osteoporosis, including secondary causes, should undergo a bone mineral density test. The most important of these risk factors include a history of fractures occurring with minimal trauma, a positive family history of osteoporotic fractures (especially a maternal history of hip fracture), current smoking, being very thin, and frequent falls. In the future, it is likely that recommendations for testing will be broadened to include all postmenopausal women, regardless of the presence or absence of risk factors.

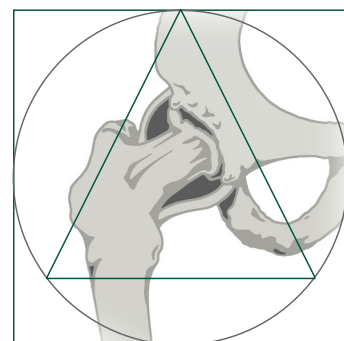
Table 1.
Recommendations of
the National Osteoporosis
Foundation

- Urge every postmenopausal woman to consider her risk of osteoporosis. Osteoporosis is a silent risk factor, just as hypertension is for stroke.
- Advise all patients to obtain an adequate intake of dietary calcium (at least 1,200 mg/day, including supplements if necessary) and vitamin D (400-800 IU/day for patients at risk of deficiency).
- Ensure that the issue of skeletal health is addressed and recorded at every office visit.
- Recommend regular exercise and avoidance of tobacco and excess alcohol.
- All postmenopausal women with fractures should be evaluated for osteoporosis, including bone mineral density (BMD) measurements.
- Suggest initiating therapy to reduce fracture risk in women with BMD T-scores < -2 if no additional risk factors and in women with BMD T-scores < -1.5 if other risk factors are present.
- Recommend BMD testing for all women aged 65 and older or for postmenopausal women below age 65 with one or more additional risk factors.

Bone mass accounts for approximately 80% of bone strength; it is the single strongest predictor of osteoporotic fractures. Current bone density measurements employ a variety of techniques that are fast, safe, and accurate. These techniques include single- or dual-energy x-ray absorptiometry (DXA), computerized tomography (QCT), and ultrasound. Densitometers are classified by the skeletal regions they measure; either central (spine and/or hip) or peripheral (forearm, tibia, wrist, finger, or heel). The preferred technique is the hip DXA test, which is the best for predicting hip fracture risk.

In addition to bone density testing, biochemical markers of bone turnover can be useful in predicting fracture risk and also for monitoring osteoporosis therapy. Bone is constantly being remodeled by a cyclic process, during which osteoclasts absorb packets of old bone tissue and osteoblasts produce new bone matrix. Bone loss occurs when the amount of old bone resorbed exceeds the production of new bone. The rate of bone formation and resorption can be assessed biochemically in two ways: by measuring the enzymatic activity of bone cells or by measuring the breakdown products of bone matrix. The most commonly used indicators of bone formation are bone specific alkaline phosphatase and osteocalcin. During bone resorption, pyridinolines and metabolized fragments of type 1 collagen are excreted into the urine; these can also be analyzed through laboratory assays. Biochemical markers reflect rates of bone remodeling, a dynamic state, but cannot confirm the presence or absence of osteoporosis and cannot substitute for bone density testing. However, elevated levels of these markers may be associated with an increase in the risk of fractures; they may be most useful in risk prediction when bone density tests show an intermediate level and a treatment decision isn't clearly indicated.

Biochemical markers can be very useful in monitoring response to antiresorptive therapy. Reductions in biochemical markers of bone formation and resorption of 40-60% can be seen within three to six months of therapy, particularly with bisphosphonates and estrogen, while 12 to 24 months are usually required to evaluate treatment response through bone densitometry.



Biochemical markers can be very useful in monitoring response to antiresorptive therapy.

Treatment

Risk factor reduction

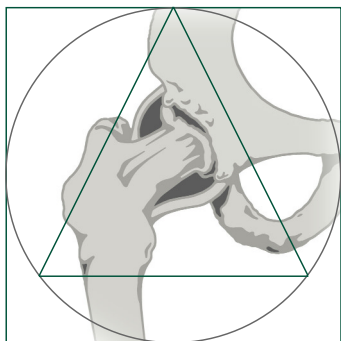
The first area to be considered in the management of osteoporosis is the reduction in risk factors. These may include eliminating smoking and alcohol abuse and reducing the risk of falls. The next step in risk reduction is optimizing nutritional status. Total daily calcium intake, from both diet and supplements, should be 1200-1500 mg. (The American diet typically provides 600 mg/day of calcium.) A daily intake of 400 IU of vitamin D (or up to 800 units in those over 65), will help maintain an optimal skeletal status. The management of osteoporosis should also include an exercise regimen. The exact prescription to be followed is not known, but it should include some weight-bearing, aerobic exercise program, such as running, calisthenics, dancing, stair climbing, or racquet sports. The goal is to strengthen the large muscle groups, with concentration on the back, shoulder, and hip musculature. In addition to helping maintain bone mass, exercise helps maintain muscle mass, which improves coordination and balance, thus reducing the risk of falling and fractures.

While not everyone needs medical therapy, women who have experienced fractures or have T-scores ≤ -2.5 should receive medical therapy. Current NOF guidelines recommend that anyone with a T-score of -2 or below, or with a T-score of -1.5 or below and additional risk factors, should receive medical therapy.

Currently approved medications for osteoporosis management include estrogen replacement therapy, raloxifene, calcitonin, alendronate, and risedronate. Parathyroid hormone may receive FDA approval in late 2002 or 2003.

Estrogen

A large body of clinical trial data has shown that estrogen produces beneficial effects on bone mass in both early and late postmenopausal women and in women who have osteoporosis. Most of the data supporting the antifracture effects of estrogen comes from epidemiological evidence rather than clinical trials. A recent meta-analysis by Torgerson et al, which examined 22 studies, showed that the relative risk of nonvertebral fractures was reduced by 27% in estrogen-treated women compared with placebo-treated women.¹³ This effect was most significant in women who were under 60 years of age or who started estrogen before the age of 60. The Heart and Estrogen/Progestin Replacement Study (HERS) is sometimes cited to strengthen the case against estrogen replacement as an effective treatment for osteoporosis.¹⁴ This study, which used conjugated estrogens plus medroxyprogesterone, showed no beneficial effect of estrogen on hip or other fractures. By contrast, results from the aborted Women's Health Initiative (WHI) trial indicate that hormone replacement therapy (HRT) reduced the risk of hip fracture by 33% and all fractures by 24%, despite the fact that this group was not at particularly high risk for osteoporosis.¹⁵



Results from the WHI trial suggest HRT, particularly the Prempro™ formulation, can no longer be routinely recommended for long-term use.

Many patients refuse to consider estrogen therapy because of a fear of breast cancer. Observational studies suggest that there is an increased risk of breast cancer after long-term estrogen use. Results from the WHI trial confirm that HRT results in an increased risk of breast cancer of about 25%, even within the first five years of therapy.¹⁵ This translates into eight additional cases per 10,000 women per year. These results, which received extensive publicity in the lay as well as the professional press, suggest that HRT, particularly the Prempro™ formulation, can no longer be routinely recommended for long-term therapy.

SERMs

The selective estradiol receptor modulators (SERMs) produce some of estrogen's multisystemic effects, but do not increase the risk of breast cancer. In fact, the SERMs studied to date, tamoxifen and raloxifene, appear to reduce the risk of breast cancer. Only raloxifene is currently approved for the prevention and treatment of osteoporosis. In the Multiple Outcomes of Raloxifene Evaluation (MORE) trial, raloxifene was shown to produce modest effects on bone density and to produce reductions in bone turnover markers.¹⁶ Raloxifene reduces the

risk of vertebral fractures, although there are no data confirming that it reduces nonvertebral fractures. Other major effects of raloxifene to emerge from the MORE trial include significant reductions in the incidence of breast cancer and cardiovascular and cerebrovascular disease. Tamoxifen has been used as an adjuvant therapy for breast cancer for several decades and is now used for breast cancer prevention. Tamoxifen is not suitable as a substitute for estrogen in the prevention or treatment of osteoporosis, since it produces estrogenic effects on the uterus, including endometrial hyperplasia and endometrial cancer. It also has undesirable anti-estrogenic effects on the brain, resulting in hot flashes.

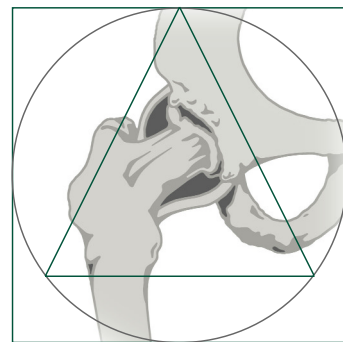
Calcitonin

Calcitonin is a 32-amino acid, single-chain peptide secretory product of neuro-endocrine C-cells located in the human thyroid gland. Calcitonin is a potent inhibitor of osteoclast function. There are two approved dosage forms, injectable (which is rarely used and is associated with nausea, vomiting, and flushing) and a nasal spray. After administration of calcitonin, there is a rapid decrease in bone resorption and hypocalcemia. However, good evidence of antifracture efficacy is difficult to find. Evidence from the Prevent Recurrence of Osteoporosis Fractures (PROOF) study of nasal calcitonin is compromised by the fact that only 378 women completed the study out of 1255 enrolled.¹⁷ In this study, a 400-unit dose of calcitonin nasal spray did not produce a significant reduction in vertebral fractures. Clearly, calcitonin produces a much weaker effect on bone than other agents for osteoporosis management.

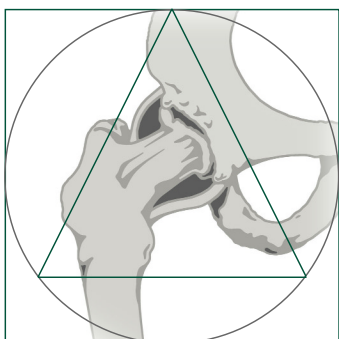
Bisphosphonates

Bisphosphonates are synthetic compounds that were initially developed for industrial use, to inhibit the growth of crystals. They were soon discovered to have a number of biological effects, including the ability to inhibit osteoclast-mediated bone resorption. The magnitude of this effect depends on a number of factors, including inherent drug potency, dose, route of administration, and rate of bone turnover.

Alendronate is the most potent drug currently available for the treatment of osteoporosis. The agent was studied in the Fracture Intervention Trial (FIT), a very large, randomized, controlled trial that included 6,459 participants and several years of observation (Table 2).¹⁸ All of the enrolled women had low hip bone mineral density scores (T-scores < -1.6). Women were randomized to receive either 5 mg/day of alendronate or placebo. On the basis of new data indicating improved efficacy on bone mass, the dose was increased to 10 mg after two years. The dropout rate was less than 4%. The women who received alendronate achieved substantial increases in bone mineral density (mean, 7%-9% at the spine and 5%-8% at the hip compared to placebo). Alendronate was also shown in this trial to reduce the risk of hip fracture by 56% by year four in women who had osteoporosis but no prior vertebral fractures. The incidence of new vertebral fractures was reduced by 50%.¹⁸ Meta-analyses of all of the clinical trials of alendronate showed consistent reductions in hip-fracture risk of approximately 50%, as well as significant reductions in the risk of vertebral and wrist fractures.¹⁹



Alendronate is the most potent drug currently available for the treatment of osteoporosis.



A long-term trial of alendronate showed that spinal bone density continues to increase over time and that bone density increases at other sites are maintained. In addition, discontinuation of alendronate does not appear to be associated with the accelerated bone loss seen in women who discontinue estrogen.²⁰

In over 17,000 patients studied, alendronate has been found to be generally safe and well tolerated. In the FIT study, there were no significant differences between alendronate and placebo in the incidence of adverse effects.¹⁸

Two-year data have shown that once-weekly administration of alendronate 70 mg produces bone density and turnover effects identical to those seen with daily 10-mg doses; this is now the recommended dose. The bisphosphonates must be taken on an empty stomach, first thing in the morning with water only and cannot be followed by any food or drink for at least 30 minutes.

Table 2.
Fracture Intervention Trial (FIT) of alendronate¹⁸

Two treatment arms: Vertebral Fracture Arm (VFA) and Clinical Fracture Arm (CFA)

VFA results (compared to placebo):

- New radiographic vertebral fractures reduced by 47%
- Multiple vertebral fractures reduced by 90%
- Symptomatic vertebral fractures reduced by 55%
- Hip fractures reduced by 51%^{18,21}

Predefined pooled analysis of VFA and CFA results (compared to placebo):

- Hip fractures reduced by 56% in osteoporotic women without prior vertebral fracture
- New hip fractures reduced by 63% within 18 months²²

Risedronate is also approved for the prevention and treatment of osteoporosis. Risedronate produces moderate effects on bone mass in both the spine and hip and reduces the risk of fracture throughout the skeleton. The fracture data with this agent derive from three studies; two assessing vertebral fracture and all nonvertebral fractures and one looking primarily at hip fracture. In the two Vertebral Efficacy with Risedronate Therapy (VERT) studies, risedronate reduced the risk of vertebral fractures by approximately 40% at three years (Table 3).^{23,24} Benefits became apparent early, after 12 months, and were sustained for at least five years. Risedronate hip fracture data come from the Hip Intervention Program (HIP) study of over 9,000 women.²⁵ This study included two patient groups; the first were women aged 70-79 who had severe osteoporosis (T-scores ≤ -4 or T-scores ≤ -3 with additional risk factors). In this group, there was a reduction in the incidence of hip fracture of approximately 40% by the third year (pooled data from patients receiving 2.5 mg/day and 5 mg/day). However, in the other group enrolled in the HIP study, women over 80 who had risk factors but no proven osteoporosis, there was no statistically significant reduction in hip fractures. This result is surprising and there have been a number of possible explanations. The group tested may simply have been unusually healthy, which

suggests that bone mineral density testing is an important predictor of the efficacy of osteoporosis therapy. In addition to the conflicting data from the HIP study, the VERT studies showed no effect on the occurrence of hip fractures. Although hip fracture was not a primary endpoint, the results are remarkable and possibly due to the high dropout rates seen in these studies.

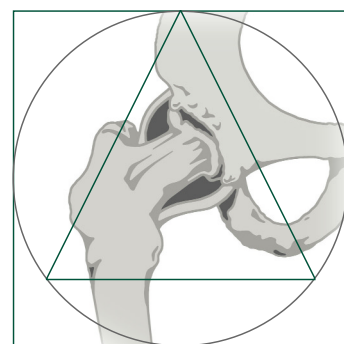
VERT results:	HIP study results:	Table 3. Vertebral Fracture (VERT) and Hip Intervention Program (HIP) studies of risedronate²³⁻²⁵
<ul style="list-style-type: none"> ■ Radiographic vertebral fractures reduced by 41-49% over three years in osteoporotic women ■ Nonvertebral fractures reduced by 33-39% over three years ■ No significant reduction in hip fractures 	<ul style="list-style-type: none"> ■ Hip fractures reduced by approximately 40% in women aged 70-79 who had severe osteoporosis ■ No reduction in hip fractures in women over 80 with risk factors but no proven osteoporosis 	

Recombinant parathyroid hormone (PTH)

Parathyroid hormone is a principal regulator of calcium homeostasis and works through a mechanism completely different from that of estrogen, SERMs, calcitonin, or bisphosphonates. PTH is a bone-formation stimulating agent. It not only increases bone mass, but also seems to restore bone architecture by filling in cavities and cancellous bone caused by the bone loss process. PTH can cause large increases in bone mass both when given alone and when combined with antiresorptive agents. Clinical trials are now underway assessing the effectiveness of PTH in combination with bisphosphonates or raloxifene. PTH may receive FDA approval in late 2002 or 2003.

The largest study of PTH included 1,637 women with low BMD and an average of 2.3 fractures at baseline.²⁶ They were randomized to receive either placebo or either 20 or 40 µg/day of PTH. Median follow-up was 21 months. After a median treatment period of 18 months, PTH was shown to have a potent effect on fracture occurrence, with a reduction of 65% to 69% in the incidence of vertebral fractures and a reduction of 35% to 45% in all nonvertebral fractures. This trial reinforced findings from earlier studies, which showed PTH to be a safe and effective therapy for enhancing bone mineral density. Back pain, nausea, and headache were the most common side effects; these occurred infrequently and were dose-dependent. Fewer than 5% had sustained increases in serum calcium above the normal range.

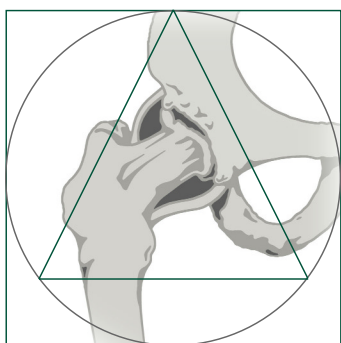
PTH will doubtless prove to be a valuable addition to the armamentarium, as a single agent or in combination with antiresorptive therapy. It is likely that antiresorptive agents will be required to maintain the bone mass and bone architecture benefits induced by PTH. It is possible that the anti-fracture benefits of PTH and antiresorptive therapy will be additive. Animal studies combining PTH with estrogen or a bisphosphonate have had promising results, producing increases in bone mass, connectivity, and strength.



Summary

In summary, clinicians are fortunate today in having a variety of effective antiresorptive therapies that reduce the risk of vertebral fractures. The bisphosphonates also reduce the risk of nonvertebral fractures, including hip fractures. These drugs can dramatically reduce the disability, the quality of life changes, and the mortality associated with osteoporotic fractures. However, much remains to be done in the area of diagnosis. Only one in three women with vertebral fractures has been diagnosed.¹¹ Osteoporosis can be treated at any stage, but for optimal treatment, it is important that we identify women with osteoporosis prior to the occurrence of the first fracture.

Case studies (submitted by
Felicia Cosman, M.D.)



We can no longer routinely consider hormone replacement therapy as a treatment for the rest of a person's life.

Case 1

A 52-year-old woman, approximately nine months from her last menstrual period complains of hot flashes, night sweats and irritability. She asks for a bone density test because her mother had very stooped posture from a very young age. The BMD score in the spine is determined to be -2.2 . This woman is clearly a very good candidate for estrogen or hormone replacement therapy.

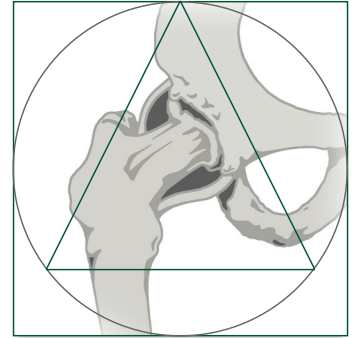
She has no specific contraindications for hormone replacement therapy and has substantial menopausal symptoms. This is a major indication for the use of estrogens. Her bone density is in the osteopenic, or low bone mass range, and she requires therapy for prevention of bone loss because of this as well as her family history of presumed osteoporosis. The question will be how long estrogen should be used in this woman. We can no longer routinely consider hormone replacement therapy as a treatment for the rest of a person's life.

Case 2

A 56-year-old woman recently developed back pain and acknowledged to her doctor that she had had approximately a one or perhaps slightly more than a one-inch height loss. Her x-ray did not show any clear abnormalities but there is a possibility of mild or minimum wedging of one vertebra. Her doctor suggested a bone density test. The BMD score in the spine was -2.3 and in the hip was -1.5 . Her mother was recently diagnosed with breast cancer. This 56-year-old woman is a classic case of a woman with early osteoporosis of the spine on x-ray. It is important that physicians review x-rays with radiologists, because sometimes mild wedging on x-ray may not be reported in a typical x-ray report. However, this may be an early sign of vertebral osteoporosis. Her bone density T-score is also nearly in the osteoporotic range of -2.5 or below and with the x-ray evidence as well as the low bone density score, she is certainly a good candidate for treatment of osteoporosis whether or not her back pain was really related to this wedging. Because her mother was recently diagnosed with breast cancer, she is probably not a good candidate for hormone replacement therapy. She is an excellent candidate for raloxifene, which not only reduces risk of vertebral fractures but may also reduce the risk of breast cancer in the future.

Case 3

A 62-year-old woman sees a new internist. She is well, but is going for a routine general physical exam and the new internist performs a comprehensive medical interview. She tells the doctor that she had a wrist fracture at age 54 after a fall when she slipped on a patch of ice on her driveway. The physician orders a bone density test which shows her T-score in the hip to be -2.3 . The T-score in the spine is -2 . However, there is an apparent artifact overlying at least one of the vertebrae. This is a classic case where the hip T-score should be used to determine the need for medical therapy in combination with the clinical history. This woman has a bone density nearly in the osteoporotic range and she also had an osteoporosis-related fracture of the wrist. The T-score in the spine should not be used to dissuade therapy, since it probably involves artifact and because the hip BMD is probably the preferential test in women of her age group or perhaps in all postmenopausal women. Therapy, in addition to general nutrition and exercise should be considered here and the treatment of choice is probably a bisphosphonate. This woman is not having any menopausal symptoms, so starting estrogens at this point in time after menopause would therefore not be the treatment of choice. And because she already had a wrist fracture and a low bone density in the hip, she is showing that she is at risk for nonvertebral fractures. The only drugs that clearly reduce nonvertebral fractures are the bisphosphonates, so she was started on alendronate 70 mg once weekly because that is the easiest and most practical regimen currently available for osteoporosis treatment.



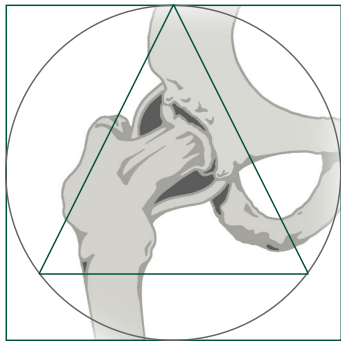
The only drugs that clearly reduce nonvertebral fractures are the bisphosphonates.

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Post-Test Questions

(8 correct answers are required for credit)



1. What is the mortality incidence in the first year following a hip fracture?
 - A. 10%
 - B. 24%
 - C. 36%
2. What percentage of women who suffer a hip fracture will fully recover?
 - A. 10-15%
 - B. 20-25%
 - C. 50%
3. At what approximate age is maximum bone mineral density achieved?
 - A. 17
 - B. 20
 - C. 28
4. Which of the following can contribute to bone loss?
 - A. Multiple myeloma
 - B. Smoking
 - C. Excessive amount of thyroid hormone
 - D. All of the above
 - E. A. and B. above
5. What is the lifetime risk for osteoporotic fractures in men?
 - A. 15%
 - B. 25%
 - C. 45%
6. The National Osteoporosis Foundation recommends that all women age 65 or older have a bone mineral density test regardless of the presence of risk factors for osteoporosis.
 - A. True
 - B. False
7. Bone mass accounts for what percentage of actual bone strength?
 - A. 50%
 - B. 65%
 - C. 80%
8. To reduce the risk of osteoporosis, what is the total daily recommended intake of calcium?
 - A. 600 mg
 - B. 800-1000 mg
 - C. 1200-1500 mg
9. According to the results of the WHI study, what was the reduction in risk of hip fracture associated with estrogen?
 - A. 33%
 - B. 43%
 - C. 50%
10. In the pooled analysis of the vertebral fracture arm and clinical fracture arm results from the FIT trial, what was the percent reduction in hip fractures in osteoporotic women without prior vertebral fracture who received alendronate?
 - A. 25%
 - B. 37%
 - C. 56%
11. In the HIP study, what was the reduction in risk of hip fracture associated with risedronate in women aged 70-79?
 - A. 25%
 - B. 40%
 - C. 50%
12. In the HIP study, what was the reduction in risk of hip fracture associated with risedronate in women aged 80 and older?
 - A. 25%
 - B. 40%
 - C. There was no significant reduction in hip fractures in this age group.

ACTIVITY EVALUATION

Activity Evaluation

1. As a result of the information contained in this activity, will you make any changes in your practice? Yes _____ No _____
If yes, what changes? _____

2. In your opinion, how could this activity be improved? (e.g., change format, more details, fewer details, discuss other topics, change length) _____

3. Please rate the educational value/clinical relevance of this activity.
____ Excellent/outstanding ____ Very good ____ Good/above average
____ Fair/acceptable ____ Poor/unacceptable
4. Please rate the extent to which the learning objectives were met.
____ Excellent/outstanding ____ Very good ____ Good/above average
____ Fair/acceptable ____ Poor/unacceptable
5. Was the material presented objectively and did it avoid commercial bias?
Yes _____ No _____ Comments: _____

6. Suggestions for future topics: _____

7. Other comments: _____

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OSTEOPOROSIS: THE ERA OF THE BISPHOSPHONATES PART I

Activity Number: END 00 09 102 02

Expiration date: 08-31-04

To earn one (1) hour of category 1 CME credit after reading this monograph and listening to the accompanying audio CD, please mail the completed post-test answers, activity evaluation, and personal information questionnaire in the enclosed envelope.

Post-Test Answers

(Circle the appropriate letter for each question.)

1. ABC 2. ABC 3. ABC 4. ABCDE 5. ABC 6. AB
7. ABC 8. ABC 9. ABC 10. ABC 11. ABC 12. ABC

