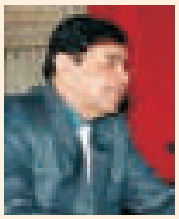

President's Message

As we from the team of FOGSI Cares-2007 bid adieu, we present the last FOGSI Focus of this team on a specialized theme: Women and Osteoporosis.

During the year we have remained by and large focused to generalists amongst us, giving them the latest in day to day practice. This FOGSI Focus is a little different. It touches an area which we as gynecologists can prevent but when we don't, the patients don't come to us but are treated by others. That challenge is indeed osteoporosis in women. The issue of preventing many challenges following menopause in women was settled with HRT. But some research jolted us out and we needed to review the rationality of what we were doing in managing menopause.

Dr. Atul Munshi the Senior Vice-President of FOGSI as the editor of has generated this worthy information backup which practitioners can readily refer to. I am sure, as with the previous three FOGSI Focus during our tenure, this time too we will be able to give you satisfactory information an the subject.

Happy reading!

Dr. Pankaj Desai

Editor's Message

Menopause is a multifaceted problem & involves many specialities for management.

Osteoporosis is a silent process usually diagnosed quite late, often as a sequle of menopause.

Though osteoporosis, directly do not involved gynecologist, as we are primarily dealing with women's health, it is our duty to prevent if possible, or at least diagnose osteoporosis & osteopenia in time to avoid crippling aftermaths.

Our previous 3 publications are well received & we have got positive feedback.

For this edition on osteoporosis we have invited contributions from different specialists, expert in the field. I am sure this will help fellow Fogsians to tackle osteoporosis in a broader perspective.

Please do spare some time to fill up & post the feedback form.

Wishing you all, "HAPPY 2008".

Dr. Atul Munshi
For team 2007

Contents

Dr. Rama Vaidya
Dr. Ikram Khatkhatay
Mumbai

Osteoporosis
A Crippling Disease

Osteoporosis is defined as "a disease characterized by low bone mass and micro-architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk". Inspite of being a crippling disease with an associated with high risk of fracture of the hip, spine and other skeletal sites and subsequent increased morbidity and mortality, it is often silent. With increasing life - expectancy, the burden of this public- health problem is mounting. Its incidence rises steeply after menopause as bone loss accelerates with estrogen deficiency. In addition metabolic bone disease secondary to dietary calcium insufficiency and 25(OH)D deficiency is prevalent in our country. In a study of healthy South Indian women, dietary intake of calcium in women was found to be low (306 $\pm$ 2 mg/day). Vitamin D deficiency (75 %) and insufficiency (19 %) were also high2 In other study Shatrugna V, from Hyderabad has reported mean intake of calcium, as 270 $\pm$ 57 mgs / day, very low as compared to the RDA of 800- 1000 mgs / day.[3]

In a back-drop of nutritional insufficiency and lack of exposure to sunlight due to increasing urbanization, Indian postmenopausal women are at a greater risk of Osteopenia/Osteoporosis as compared to their counterparts from Western Countries. Osteoporosis data from various parts of our country point towards enormous magnitude of this public health problem.

Diagnosis of Osteoporosis and incident fracture risk should be made by comprehensive workup. History of risk factors (family history, h/o previous fractures, medicine like thyroid; corticosteroid etc. nutritional sufficiency / insufficiency; physical activity/ immobilization etc.) should be obtained in detail. Dual Energy X-Ray Absorptiometry provides gold standard for determining Bone Mineral Density (BMD). Currently WHO criteria for the diagnosis of osteoporosis needs to be used. Though calcaneal Quantity Ultrasound (QUS) method has its limitations for diagnosis of Osteoporosis, it is useful for community-screening. Biochemical estimations for bone markers are more useful for monitoring outcomes of therapy than for diagnosis.[4]

In conclusion, with evolving knowledge and emerging data about Osteoporosis and availability of tools for its diagnosis, members of IMS are urged to prevent / or treat this menace of Osteoporosis amongst our menopausal women.

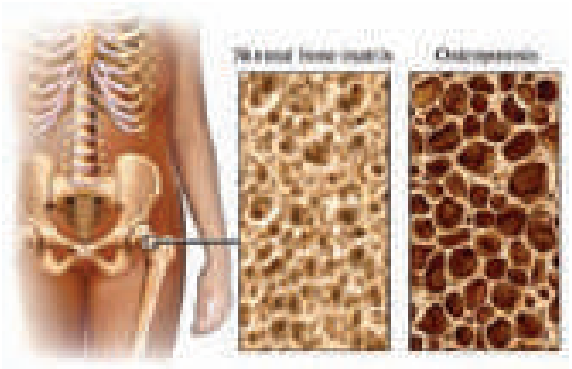

Table 1: Osteoporosis: national and international scenario

Prevalence (%)	Subjects	Type	Site	Diagnostic method	Reference
Prevalence (%) Femoral neck; Osteopenia- 52 Osteoporosis -29 Lumber spine Osteopenia- 43 osteoporosis -43	N= 289, (30-60 yrs)	community based, low income, Hyderabad	Spine, hip, arm whole body	DXA	Shatrugna V et al Osteoporos Intl, 2005 16(12):1827-35.
Calcaneum Osteopenia- 36.8 Osteoporosis -20.3	N= 158 (35-64 yrs)	Hospital based, middle income group, Jummu	Calcaneum	QUS	Sharma S et al Ind J Med Sc, 2006,60: 183-189
Femoral neck; Osteopenia-55 Osteoporosis -25 Lumber spine Osteopenia- 39 osteoporosis -45	N= 100 (45-54 yrs)	community based, Mumbai	hip	DXA	Saverdekar L and Shah R , Obgy Today,2004, Nov.
Femoral neck; Osteopenia-54 Osteoporosis -47	N=97 (55-64 yrs)	Community based, Mumbai	spine	DXA	Saverdekar L and Shah R , Obgy Today,2004, Nov.
Lumber spine Osteopenia- 14.4 osteoporosis -80.4	N=163979 (postmeno-pausal)	USA			
Osteopenia-40 Osteoporosis -7.2				DXA	Siris ES et al, JAMA: 2001,286:2185-2822
Pre- Osteopenia-14.5 Osteoporosis -0.4 Post- Osteopenia-42.8 Osteoporosis -0.4-12.7	N=5896 (pre & postmeno-pausal yrs)	Denmark			Smeets-Goevaers CG et al Osteoporos Intl, 1998 8:404-409

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Dr. Rama Vaidya
Phone: 022-26492314, 66487500
Email:vaidya.rama@gmail.com

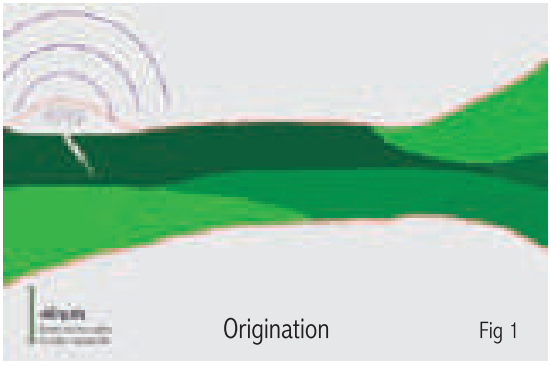
The Secret Life of a bone

Physiology of bone formation and destruction

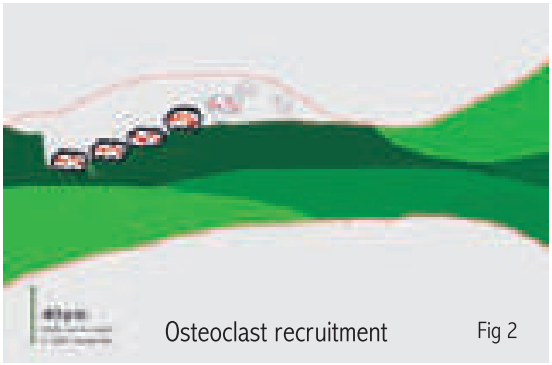
Dr. Vikram I. Shah
Dr. Pranav A. Shah
Ahmedabad

While many factors contribute to the strength of the skeleton and its ability to withstand trauma without fracture, the major determinant accounting for at least 70% of bone strength is bone mineral density (mass per volume). Approximately 80% of the total skeletal mass is cortical (compact) bone with a low surface: volume ratio, while the remaining 20% is cancellous (spongy) bone with a much higher surface: volume ratio. However, the microarchitecture of cancellous bone appears to develop along patterns governed by mechanical loading of the skeleton, and presumably makes a contribution to bone strength greater than can be accounted for by mass alone.

The skeleton is a complex organ system that is under a constant state of flux. It serves mechanical, metabolic and protective functions. There are two general types of bone, cortical and cancellous. Cortical bone is found primarily in the shafts of the long bones of the appendicular skeleton. It is also found as the outer layer of virtually all bones. Cancellous bone is found primarily in the bones of the axial skeleton and in the ends of the long bones. The cellular processes of bone activity by which both cortical and cancellous bone are maintained is referred to as **bone remodeling**. This remodeling process takes place on bone surfaces in discrete packets known as basic multicellular units (**BMU**).



Origination Fig 1

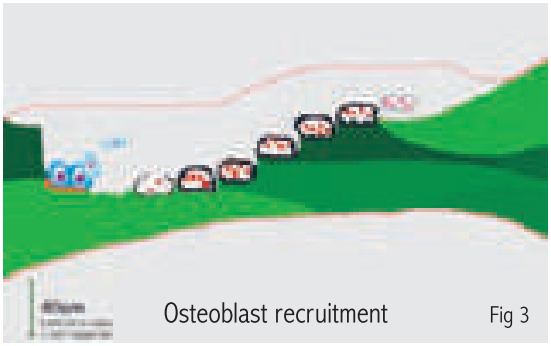


Osteoclast recruitment Fig 2

After microdamage (**Fig.1**) to the bone, following mechanical stress, following exposure to some cytokines, or at random, a BMU (Basic Multicellular Unit) will originate. The osteocytes secrete messages to the surface cells. A circulatory canopy is formed from the lining cells.

Stromal cells that have been activated by messages from osteocytes or IL-1, PTH, calcitriol, etc (but not IL-6) will then produce M-CSF (macrophage colony stimulating factor) which stimulates differentiation of cells into pre-osteoclasts (**Fig.2**). The stromal cells also divide to produce pre-

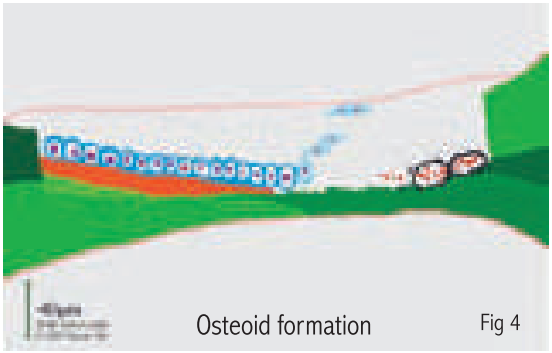
osteoblasts, which express RANK-ligand (RANK-L) on their cell surfaces. Pre-osteoclasts have membrane receptors called RANK, related to the TNF family. When RANK-L activates these receptors the cells fuse and differentiate into mature **multinucleated osteoclasts** which develop a ruffled border and **resorb bone**. Meanwhile, OPG is a free-floating decoy receptor, made by mature osteoblasts, which can bind the RANK-L.



Osteoblast recruitment Fig 3

The mature osteoclasts resorb bone (**Fig.3**) by forming a space on the matrix surface and secreting hydrogen ions and cathepsin into the space. As the BMU wanders, new osteoclasts are continuously activated and then start resorption. At any one spot on the surface the resorption lasts about two weeks. The osteoclasts then undergo programmed cell death or **apoptosis**, which is delayed by estrogen deficiency.

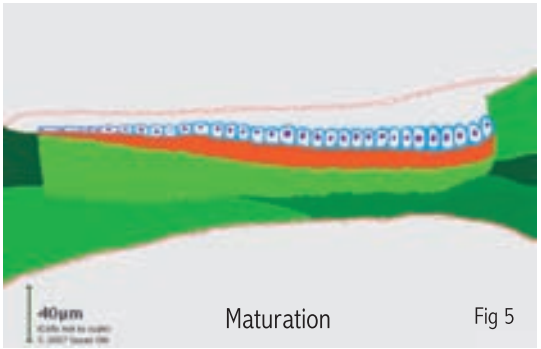
Osteoblasts are derived from marrow stromal cells, which can differentiate into either adipocytes or osteoblasts; the transcription factor Runx2 (previously named Cbfa1) is necessary for osteoblastic differentiation. Osteoblasts are probably attracted by bone-derived growth factors like Wnt, bone morphogenic proteins, and interleukin, (**IL1**). Osteocytes tonically secrete sclerostin which inhibits Wnt-signalling.



Osteoid formation Fig 4

The active, secreting osteoblasts make layers of osteoid (**Fig.4**) and slowly refil the cavity. They secrete growth factors, osteopontin, osteocalcin, osteoprotegerin (**OPG**) and other proteins.

When the osteoid is about 6 microns thick, it begins to **mineralize**. This process, also, is regulated by the osteoblasts. Osteoblasts also primarily regulate phosphate metabolism through PHEX and FGF-23, whose mechanisms of action are still uncertain. Osteoblast life-span is regulated by estrogens and other hormones.



Maturation Fig 5

For months after the cavity has been filled with bone, the crystals of mineral are packed more closely (**Fig.5**) and the density of the new bone increases (**maturation**).

The final osteoblasts turn into lining cells which participate in the minute-to-minute release of calcium from the bones. Some of the osteoblasts also turn into osteocytes which remain in the bone, connected by long cell processes which can sense mechanical stresses to the bones (quiescence).

There is an interdependency of the osteoclastic and osteoblastic activities whereby osteoclasts are initially recruited to a particular site on the bone surface, when their task is completed, they signal the osteoblasts to attend to that same site. This interrelationship is known as coupling and is a crucial link in the chain of bone remodeling events (4). Any situation that interferes with the coupling process or causes imbalance between the bone-forming and bone-resorbing relationship can lead to significant loss of bone mass over time.

Regulation of the bone-remodeling process is complex. Undoubtedly, there are numerous systemic hormones, such as parathyroid hormone, 1, 25-dihydroxy vitamin D (calcitriol), calcitonin, estrogens and androgens which serve in part to regulate the process. Vitamin D is recognized as a stimulator of osteoclastic formation and a promoter of osteoblast differentiation (5). There are also numerous local factors that play an important role in the physiology of bone remodeling-interleukins (IL-1 and IL-6), transforming growth factors, prostaglandins, tumor necrosis factor, lymphotoxin, colony stimulating factors, prostagamma interferons to name a few (6-9).

We know that, in both men and women, skeletal mass gradually increases during growth and development and reaches some maximum point between the ages of 18 and 35. We further know that both men and women gradually lose bone after that point in time as part of the aging process. It appears that the cancellous bone mass begins to be lost earlier on than the cortical bone mass, perhaps by as much as a 20-year differential(11). This difference can be accounted for by the greater surface: volume ratio of cancellous bone that makes it more susceptible to any deleterious effects of bone remodeling, which only takes place on skeletal surfaces.

There are two factors determinng level of bone mass at any particular age in males and females. These are peak adult bone mass and the duration and rate of bone loss. Peak adult bone mass represents the maximal result of growth and consolidation and is reached between the ages of 18 and 35. Peak adult bone mass is about 25-30% higher in males than it is in females and about 10% higher in blacks than in whites (22). Bone mass accounts for 75-80% of bone strength and, as such, is the most important determinant of bone strength (23). It is affected by -

* Genetic factors
* Adequate production of sex hormones
* Environmental factors (Low calcium and protein intake, deficient intake of other nutrients, endocrine dysfunction, chronic illness, malnutrition and immobilization may all result in a suboptimal peak adult bone mass and thereby increase the risk of developing osteoporosis later in life.)
* Physical activity (Weight-bearing exercise is generally an enhancer of bone formation)

Suggested Reading

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Dr. Vikram I. Shah
Phone: 098240 36200
Email:pranavchishah@gmail.com

Endocrinology of Osteoporosis

Dr. Ambrish Mittal
New Delhi

Osteoporosis is a disease characterized by low bone mass with micro architectural deterioration of bone tissue leading to enhance bone fragility.

Bone is formed of collagen, which forms the framework, and calcium phosphate, which forms the mineral. There are two types of bone- cancellous and cortical. Cancellous bone, which is metabolically active, consists of an interconnecting lattice network. It is predominantly found in the axial skeleton e.g. vertebral bodies. Cortical bone forms the compact shell around cancellous bone and is formed in both axial and peripheral skeleton e.g. Forearm [1].

Bone Remodeling [2]: The mechanical integrity of the skeleton is maintained by the process of bone remodeling which occurs throughout life. This process of regeneration, degradation and repair, allows damaged bone to be replaced by new bone. Remodeling can be subdivided into four phases (Fig 1):

Resorption- Activated lining cells along with osteoblastic precursors secrete RANKL (receptor activator of nuclear factor kappa B) which along with M-CSF(Macrophage colony stimulating factor), NFkB (Nuclear factor Kappa B) and c-fos promotes differentiation and activation of committed precursors to mature osteoclasts. These produce bone resorption.

Reversal - Osteoclastic bone resorption is followed by apoptosis of osteoclasts and differentiation of osteoblasts.

Formation- The active, secreting osteoblasts then make layers of osteoid and slowly refill the cavity. This then gets mineralized, increasing the bone density.

Quiescence- The final osteoblasts turn either into lining cells which participate in calcium release from bone or osteocytes which senses mechanical stresses to the bone.

The whole cycle takes about 8 months. Bone loss occurs because of (1) Increased bone resorption (2) Decreased osteoblast function (3) failure to achieve optimal peak bone mass.

In childhood and adolescent period bone formation exceeds resorption. After 30 years of age, resorption begins to exceed formation.

Hormonal influence - Estrogen deficiency during menopause and high PTH levels seen with ageing increases the secretion of cytokines: IL-1, IL-6, TNF, M-CSF, and RANK L, which leads to increased bone resorption. Calcium or vitamin D deficiency leads to secondary hyperparathyroidism which accounts for bone resorption.

Peak bone mass is attained at about 30 years of age. Peak bone mass is primarily determined by genes but may be modified to a considerable extent by certain factors like physical activity, calcium and vitamin D nutrition, smoking and alcohol, concurrent illnesses, medication (glucocorticoids, antiepileptics). The level of peak bone mass achieved at puberty is a major determinant of bone mass in later life and hence an important factor in the ultimate development of osteoporosis.

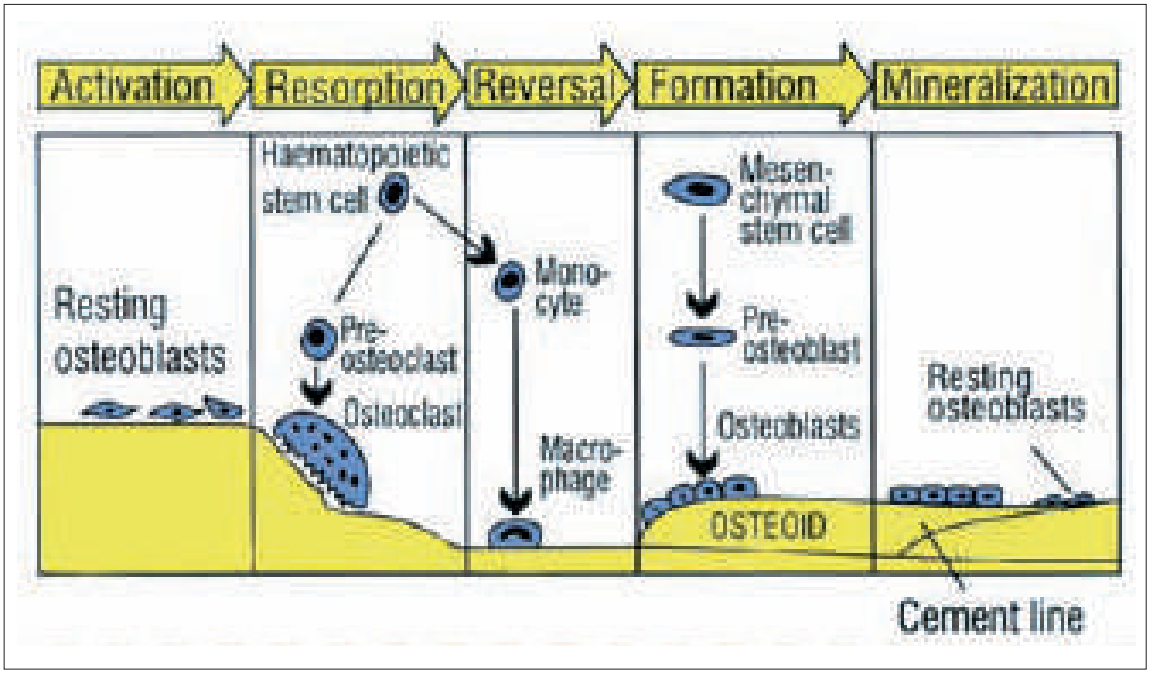
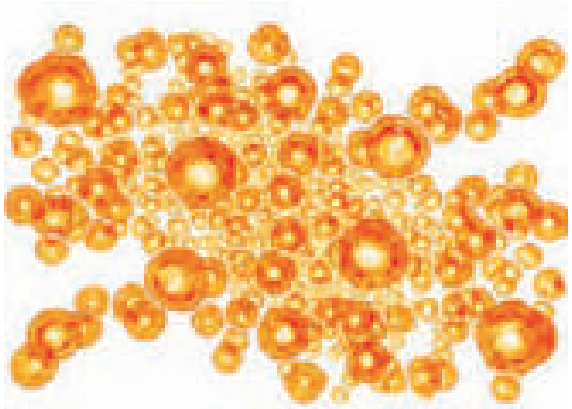


Fig 1: The bone remodeling cycle (From osteoporosis state of the art, 2004).



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Dr. Ambrish Mittal
Phone: 011-26139023
Email: ambrishmithal@rediffmail.com

Risk and risk prevention of Osteoporosis

Dr. Meeta Singh
Hyderabad

INTRODUCTION

Risk prevention and treatment depends upon identifying Absolute Risks in an individual. In 1994 WHO's operational definition of post menopausal osteoporosis was based on Bone Mineral Density and allowed for diagnosis before fracture. But it did not provide recommendation for treatment intervention threshold. The goal of management is to prevent fractures and the selection of patients with the highest risk for fracture targets population most likely to benefit from therapy.

RISK FACTORS:

PRIMARY OSTEOPOROSIS

NON MODIFIABLE	POTENTIALLY MODIFIABLE
Age Caucasian Race Female Gender Family History of fracture Personal History of fracture Dementia Poor Health or Frailty	LIFE STYLE Low Body Mass Index(< 127lb) Current Cigarette smoking Alcoholism Inadequate Physical Activity Impaired Eye Sight Falls Poor Health or Frailty ESTROGEN DEFICIENCY Premature Menopause Prolonged Premenopausal Amenorrhea (>1year) NUTRITIONAL DEFICIENCY Calcium, Magnesium, Phosphorous, Boron, Manganese, Copper, VitaminD,C.K,B6,B16,Folic Acid

DISEASES AND DRUGS ASSOCIATED WITH OSTEOPOROSIS

INFLAMMATORY DISEASE	GASTROINTESTINAL DISEASE
Rheumatoid Arthritis Ankylosing spondylitis Inflammatory Bowel Disease	Coeliac Disease Chronic Pancreatitis Chronic Liver Disease Cystic Fibrosis
GENETIC DISEASES	**ENDOCRINE DISEASES**
Osteogenesis Imperfecta Osteogenesis- Pseudoglioma Syndrome Aromatase Deficieny Oestrogen Receptor Mutations Homocystinuria Marfan Syndrome Porphyria	Hypogonadism Thyroid Disease Hyperparathyroidism Cushing's Syndrome
MISCELLANEOUS	**DRUGS**
Haemoglobinopathy Gaucher's Disease Myeloma Systemic Mastocytosis End Stage Renal Disease Parentral Nutrition	Corticosteroids Cytotoxic Drugs GnRH Agonists Aromatase Inhibitors Anticonvulsants Anticoagulants Sedatives Thyroxine

CLINICAL ASSESSMENT OF RISK FACTORS

Various Scoring systems have been developed to screen population for selection for DEXA. For example NOF, ORAI, SCORE, WHO, OSTA.

Combining BMD with Clinical Risk factors provides a better estimation of fracture Risk than BMD and Risk factors alone.

RISK PREVENTION

Osteoporosis is a "Paediatric Disease with geriatric consequences". Prevention implies

- Establishment of Peak Bone Mass
- Maintenance of Bone Mass

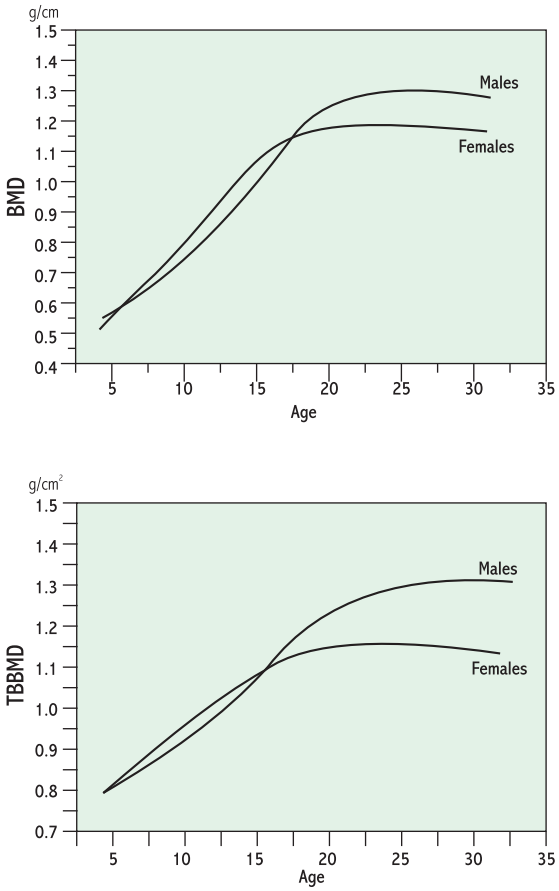

Fig.1 Changes of BMD values of the lumbar spine (A) and whole body (B) with chronologic age. The acceleration during adolescences is followed by the plateau phase in early adulthood. DXA measurements performed in 319 healthy subject (156 female, 163 male) from 4 to 32 years of age are shown. (Courtesy of Stefano Mora, MD, Milan. Italy)

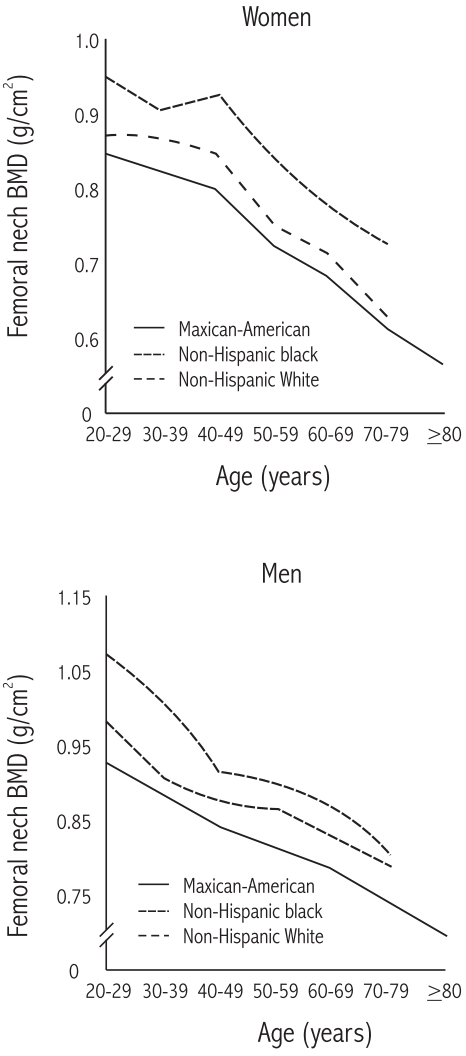

Fig. 1. Mean BMD of the femoral neck by age for US men and women of different ethnic groups (from Looker AC, Wahner HW, Dunn WL et. al. Proximal femur bone mineral Jevels of US adults Osteoporos Int. 1995-;5:389-409; with permission)

PREVENTIVE MEASURES

- Calcium rich diet
- An adequate supply of Vitamins
- Regular physical Activity.

Bones, Muscles and Joints are all strengthened by movement. The theory that putting stress or forces of gravity onto the skeletal system causes it to form more bone is known as Wolff's law.

- Maintain Ideal Body Weight
- Reduce Nutritional " Bone Robbers" i.e. High Alcohol intake, Salt(Recommended allowance 2,400mg/day), Excessive Protein (>60g/day)
- Protect the spine in everyday living.
- Fall Prevention
  -Sensible footwear, use night lights, avoid use of scatter or loose rugs,
  Install hand rails- bathrooms / shower, Non slippery flooring.
  Avoid drugs that cause postural hypotension, confusion and sedation. External hip protectors have shown to reduce hip fracture by 60%.
  Investment in prevention of falls may be as effective as pharmacotherapy to increase Bone Strength.

PREVENTION IN SECONDARY OSTEOPOROSIS

- Advise life style modification as discussed above.
- Routine BMD

PREVENTION IN GLUCOCORTICOID INDUCED OSTEOPOROSIS

- Prefer short acting Glucocorticoids
- Prefer Alternate date therapy
- Prefer topical or inhaled Glucocorticoids
- Life style modification and Nutritional supplement
- Routine BMD

FINAL WORD

The WHO, in collaboration with American Bone and Mineral Research, ISCD, IOF and NOF is developing a methodology for combining BMD with clinical risk factors to quantify fracture probability in terms of Absolute Risk over specified period of time e.g. 10% 10 year risk of Hip fracture.

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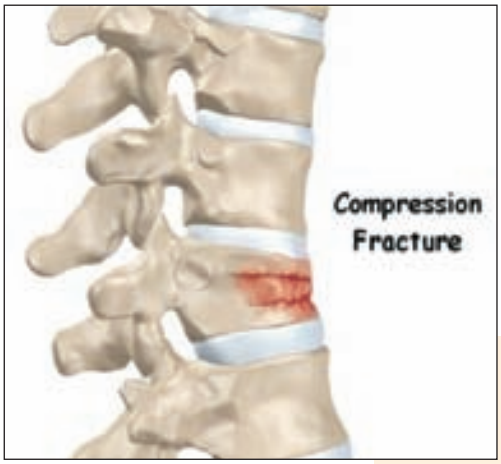

Dr. Meeta Singh
Phone: 040- 23743550,23747003, Mob: 9848040863
Email: drmeeta919@gmail.com, naunihal5@hotmail.com

Bone testing: Clinical and investigations

Dr. Ajit Athale
Baroda

Osteoporosis, the most common generalized disease of the skeleton, is defined as a decrease in bone mass accompanied by structural changes leading to an increase in fracture propensity (mostly atraumatic fractures of the spine, distal radius, proximal femur, or ribs). The association between low BMD and risk of fracture is analogous to the relationship between high serum cholesterol and risk of myocardial infarction and that between high blood pressure and risk of stroke. Current methods for evaluating skeletal status, assessing osteoporosis, and determining fracture risk rely mostly on the noninvasive measurement of bone mineral content and bone mineral density .The most commonly used and widely accepted method for examining the skeletal status is projectional measurement using dual X-ray absorptiometry, typically at the lumbar spine and the proximal femur.

Osteoporosis occurs as a result of a mismatch between osteoclast and osteoblast activity. This mismatch can be caused by many different disease states or hormonal changes or as a result of aging. In osteoporosis, osteoclasts outperform osteoblasts so that more bone is taken up than is laid down. The result is a thinning of the bone with an accompanying loss in bone strength and a greater risk of fracture. A thinning bone results in a lower bone density or bone mass. There are two major types of bone.

Cancellous bone (trabecular bone) is seen in areas such as the spine and wrists. This type of bone normally undergoes a rapid rate of turnover. As a result, if osteoclast and osteoblast activity become mismatched, cancellous bone is affected rapidly. Cortical bone is located in the arms and legs. This type of bone is metabolically slower than cancellous bone, and is therefore less affected by alterations in bone turnover.

There is a normal rate of decline in bone mass with age in both men and women. For women, in addition to age, the menopause transition itself causes an extra degree of bone loss. This bone loss is greatest in the first 3 to 6 years after menopause. Since women generally have a lower bone mass to begin with in comparison with men, the ultimate result is a higher risk of fracture in postmenopausal women as compared to men of the same age.
Fractures commonly occur in the hip, spine, and wrist.

THE IMPORTANCE OF SCREENING FOR OSTEOPOROSIS:

Early detection of low bone mass (osteopenia) or osteoporosis is the most important step for prevention and treatment. If osteopenia or osteoporosis has occurred, a person can take action to stop the progression of bone loss. The only way to accurately test the strength and solidness of the bones is with bone mineral density (BMD) tests. These tests measure the bone density in the spine, hip, and/or wrist, which are the most common sites of fractures due to osteoporosis. In subjects with low bone mass at

the hip or the spine (the 2 areas traditionally measured with DXA scanning), there is a 2 to 3 fold increase in the incidence of any osteoporotic fracture. In subjects with a BMD in the osteoporosis range, there is approximately a 5 times increase in the occurrence of osteoporotic fractures.

INDICATIONS FOR BMD TESTING:

Indications are enlisted in Table 1

Table I : Risk factors

MAJOR RISK FACTORS for osteoporosis:

* Age 65 or older
* Vertebral compression fracture
* Fracture with minimal trauma after age 40
* Family history of osteoporotic fracture
* Long-term (more than 5 months continuously) use of steroid therapy
* Medical conditions like celiac disease, Crohn's disease that inhibit absorption
* Primary hyperparathyroidism
* Osteopenia apparent on x-ray
* Hypogonadism
* Early menopause (before age 45)

MINOR RISK FACTORS

* Rheumatoid arthritis
* Hyperthyroidism
* Prolonged use of anticonvulsants
* Prolonged heparin use
* Low Body weight
* Low calcium intake
* Excess caffeine
* Excess alcohol
* Smoker

Risk factors are additive which means more risk factors, the greater the risk of developing osteoporosis.

PURPOSE OF BONE DENSITY TEST

Bone mineral density tests measure the solidness and mass (bone density) in the spine, hip, and/or wrist (the most common sites of fractures due to osteoporosis). These tests are performed like x-ray films. They are painless, noninvasive, and safe. The risk of radiation is very minimal.

TYPES OF BMD TESTS

The important methods are:

* DXA (Dual Energy X-ray Absorptiometry) measures the spine, hip or total body;
* QUS (Quantitative Ultrasound) uses sound waves to measure density at the calcareous, tibia and patella.
* QCT (Quantitative Computed Tomography) most commonly used to measure the spine, but can be used at other sites;

DEXA: DUAL X-RAY ABSORPTIOMETRY

With regard to determining longitudinal changes in BMD and monitoring the response to therapy, DEXA is characterized by a high degree of precision, moderate sensitivity, and a reasonably low radiation dose. It is the preferred & most commonly used technique for measuring BMD. It is used to measure spine and hip bone densities. Because osteoporosis results in greater relative loss of trabecular bone than of cortical bone, the ideal system of BMD measurement would evaluate chiefly trabecular bone. Of the currently available methods, quantitative CT (QCT) is closest to this ideal. However, because of its lower radiation dose, better precision and ease of use, DEXA has gained much higher acceptance than has QCT in most clinical settings.

DEXA TEST PROCEDURE:

A typical DEXA examination consists of a two-site BMD measurement including the anteroposterior lumbar spine and the proximal femur. In patients with severe degenerative disease, spinal measurement may overestimate BMD, requiring

measurement of additional sites, such as the lateral lumbar spine, the distal radius, and the total body. The test itself takes about 10 minutes. Subject has to lie flat on the machine table. Scanning of hip and spine is done by the machine.

CONTRAINDICATIONS TO DEXA SCANNING:

* Suspected pregnancy,
* Recent (<5 days) oral administration of a contrast agent,
* Recent (<2 days) nuclear medicine scan.

Of the other methods **ULTRASOUND** can easily be performed in a physician's office. This method may become valuable for screening larger populations if its accuracy becomes more refined.

SELECTION OF REGION TO TEST BMD:

The value of measurements in the spine and hip is widely accepted in the diagnosis of local and systemic osteoporotic changes. The tendency of spinal measurements to allow better discrimination of vertebral fractures and, in some cases, of other osteoporotic changes, compared with peripheral measurements has been reported in numerous studies.

If BMD is to be done for approaching menopause the bone density of hip and spine is to be determined. If patient is already taking HRT to monitor the progress, spine density it to be seen because it may take a long time for changes to show in heel, wrist or fingers.

UNDERSTANDING BONE MINERAL DENSITY TEST RESULTS

The absolute amount of bone as measured by bone mineral density (BMD) testing generally correlates with bone strength and its ability to bear weight. It is important to remember that BMD cannot predict the certainty of developing a fracture. It can only predict risk. Bone mineral density tests measure bone density in the spine, hip, and/or wrist, which are the most common sites of fractures due to osteoporosis.

The results of the bone mineral density test are compared to 2 standards (norms):

* The age-matched reading, known as the Z-score, compares a person's bone density to what is expected in someone of equivalent age, sex, and size. However, among older and elderly adults, low bone mineral density is common, so comparison with age-matched norms can be misleading.

* The young-normal reading, known as the T-score, compares bone density to the optimal peak bone density of a healthy young adult (30 years old) of the same sex. The T-score determines fracture risk, which increases as bone mineral density falls below young-normal levels. The T-score, which is a comparison between the solidness (density) of the bones and the bones of the average young healthy population, is measured in standard deviations (SDs).

* According to the World Health Organization's (WHO) diagnostic categories, individuals whose T-score is within 1 SD of the norm are considered to have normal bone density. Scores below the norm are indicated in negative numbers. For most bone mineral density tests, -1 SD equals a 10-12% decrease in bone density. The risk for broken bones increases by 50-100% for every SD below the young-normal standard.

WHO definitions of osteoporosis based on bone density levels:

* **NORMAL:** Bone density is within 1 SD (+1 or -1) of the young adult mean.
  The report shows a T score > -1 signifying a BMD within the normal range

* **LOW BONE MASS (OSTEOPENIA):** Bone density is 1 to 2.5 SDs below the young adult mean (-

1 to -2.5 SD). The report shows a T score between û2.5 and -1.This signifies an increased fracture risk but does not meet the criteria for osteoporosis.

* **OSTEOPOROSIS:** Bone density is 2.5 SDs or more below the young adult mean (> -2.5 SD). BMD in this range signifies an even higher fracture risk than osteopenia.

* **SEVERE (ESTABLISHED) OSTEOPOROSIS:** Bone density is more than 2.5 SDs below the young adult mean and one or more broken bones (osteoporotic fractures) has occurred.

In addition to the BMD results, other factors like age, gender, fracture history, family history and steroid use are also considered to determine 10-year absolute fracture risk. The presence of other risk factors increases 10-year risk of fracture to the next level/levels. The 10-year fracture risk will change with advancing age or with the development of new risk factors. Repeat assessment is appropriate in five to 10 years in those with low risk and in one to five years in those with moderate risk.

FOLLOW-UP SCANS

If a second scan is indicated, it should be done at an interval that affords a reasonable chance for the expected changes in bone density to be statistically significant. Under most circumstances, this interval is 2 years.

SUMMARY

Osteoporosis causes a significant risk of fracture. Early detection and therapy is the advisable to prevent the complications. Testing gives fair idea about risk of fracture. Dual X-ray absorptiometry (DEXA) is quick, painless and the preferred method to measure BMD. It estimates the true mass of bone. BMD analysis is recommended for women between ages 50 and 65 with risk factors and for all women over the age of 65. Upon detection, one can exercise many of treatment options available.

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Dr. Ajit Athale
Phone: 0265-2640075, 9427980845
Email: drathale@yahoo.com

Calcium Confusion:
Facts and Fiction

Dr. B. K. Shah
Ahmedabad

" The work of science is to substitute demonstrations for impressions and facts for beliefs." *Claude Bernard.*

Impressions and beliefs abound in the field of postmenopausal osteoporosis and particularly in the field of use of calcium and related substances for prevention and treatment of osteoporosis. My attempt in this presentation will be to substitute them by hard facts demonstrated by well conducted clinical trials.

Osteoporosis is a disease characterized by defective bony matrix which is made up not only of calcium but calcium laid down into a protein matrix under the influence of various hormones like vitamin D and parathormone(PTH). Nutritional aspects of prevention and treatment of osteoporosis therefore must consider providing (A) Adequate amount of calcium (B) adequate amount of proteins of high biological value and (C) required amount of vitamin D.

What can be considered adequate amount of calcium for peri/postmenopausal women is therefore a vital question and the most confusing one because international bodies of repute appear to disagree with each other. Just have a look at the following.

National Inst. Health USA	1994	1500mg/day
Inst. Med. U.S.A.	1997	1200mg/day
Nordic nutrition	1996	800mg/day
European Community	1998	550mg/day (1)

It is worth noting that dietary recommendations by ICMR/NIN (1999) (2) do not categorize post/perimenopausal women as a separate group and the recommendation for all adult women is 400mg per day.

In face of this confusion results of well conducted clinical trials / case control studies become invaluable. Studies have conclusively demonstrated that in healthy postmenopausal women with a daily calcium intake less than 400mg, calcium supplementation prevents further loss and stabilizes BMD at radius and femoral neck. Further, there was no significant effect of calcium supplementation for women with intakes of 400 to 650mg per day. Another important study indicates that dietary intake of more than 1000 mg calcium per day in areas of U.S. and northern Europe led to increase in incidence of hip fractures. (3).

The inevitable conclusion then is that a peri/postmenopausal woman will require calcium supplementation only if her calcium intake is less than 400mg/day and a daily intake more than 800mg may not be desirable.

Our next question is to find out the best way to provide the required calcium in a cost effective manner. Please recall that calcium is to be deposited in a protein matrix to provide strength and prevent fractures. No preparation available in the market provides required calcium with protein of high biological value EXCEPT ONE.

THE IDEAL PREPARATION

Calcium ..... 420 mg.
Vitamin A ..... 280 IU
Vitamin D ..... 28 IU
Protein 8.6gms. (2)
Cost Rs.3.8

Generic name for this preparation is BUFFALO MILK. Values given here are for 200ml. (one glass). Since diet of the poorer and rural sections provide about 400mg calcium/day, one glass of milk is all that your patient needs.

VITAMIN D: It serves many functions such as inhibition of PTH, increased calcium absorption from the gut and stimulation of osteoblast activity. (3). Well controlled trials have demonstrated that physiological supplements (400 to 800 IU/day) of vitamin D alone or in combination with calcium reduce PTH concentrations, increase bone density at femoral neck and reduce non vertebral fracture rates by more than 50%. (1). It is worth noting in this connection that regular exposure to sun light for 15 to 30 minutes/day produces similar biochemical changes as are observed with 400 to 800 IU vitamin D administered/day. (1). More interesting but hardly recognized fact is that Expert Committee of ICMR(2) has not made any dietary recommendations for vitamin D since adequate vitamin D can be obtained through exposure to sun light.

In other words, administration of high doses of vitamin D or alpha calcidol or calcitriol (especially with calcium in high doses) serves but only one purpose - it makes your patient excrete calcium in her urine (hypercalcemia and hypercalciuria) and she buys a real good looking renal or ureteric stone.

BISPHOSPHONATES : Though a relatively recent addition in therapy these pyrophosphate analogues have proliferated into three generations. First generation agents like Etidronate and Clodronate cause demineralization and hence are not used in therapy of osteoporosis. All bisphosphonates have high affinity for calcium and get concentrated in bones especially at sites of active remodelling. Apart from inhibiting hydroxyapatite dissolution, they favour apoptosis of osteoclasts and inhibit osteoclast function. The aminobisphosphonates (second generation - Alendronate, Ibandronate and Pamidronate) inhibit osteoclast function by interfering with mevalonate to cholesterol pathway and prenylation of proteins.(4) This opens up two attractive possibilities viz. bisphosphonates may prove useful in therapy of certain cancers and other drugs that may inhibit mevalonate to cholesterol pathway (e.g. statins) may prove to be useful antiresorptive agents. Coming to prevention and treatment of osteoporosis many large scale and long lasting (more than 3yrs.) trials have shown increase in BMD, decrease in vertebral and non vertebral fractures including hip fractures and good tolerability (1). Nausea, vomiting, esophagitis and gastric irritation are main adverse effects. To avoid these and to facilitate absorption these agents must be taken in the morning on empty stomach with a glassful of water in upright position and breakfast should be taken at least 30 to 60 minutes after drug administration. Higher doses may cause osteonecrosis of the jaw and renal impairment. (5). However, among the available therapies bisphosphonates appear to be very attractive for established cases of postmenopausal and senile osteoporosis, for glucocorticoid induced osteoporosis and for prevention of osteoporosis in high risk groups. Once weekly (alendronate and risedronate- a third generation agent-) or once monthly (ibandronate) dosing schedules can provide excellent compliance. A monthly cost of about Rs. 150 to Rs.200 seems a reasonable investment for preventing hip fractures in susceptible populations.

PARATHYROID HORMONE (PTH) : A fragment consisting of first 34 amino acids of human PTH (h PTH 1-34) is one of the aggressively promoted therapies. Though studies show that it is the only agent promoting bone formation some cautionary words from the latest edition of the bible (4) may not be out of the place.

"Direct effects of PTH on osteoblasts in vitro are generally inhibitory and include reduced formation of type 1 collagen, alkaline phosphatase and osteocalcin"

"The principal processes regulated by PTH are renal calcium absorption and mobilization of bone calcium"

"Continuous administration of PTH .....causes bone demineralization and osteopenia"

Coupled to the prohibitive cost and the need for parenteral administration these words should suffice for any rational therapist in opining against the use of this agent at present.

FLUORIDES : Presently not in vogue. Provides an excellent example how medical fashions dictate therapeutic regimes.

So, to sum up :

1. Prevention of osteoporosis starts in childhood with adequate dietary calcium intake and exposure to sun light.
2. Regular weight bearing exercises, avoidance of smoking and alcohol as life style measures.
3. One or two glasses of buffalo milk daily with exposure to sun light for 15 to 30 minutes/ day in peri and postmenopausal period.

These are effective preventive measures against postmenopausal osteoporosis and women who are healthy otherwise DO NOT NEED OTHER THERAPIES.

For established cases of osteoporosis and for high risk groups bisphosphonates appear to be safe, effective and financially acceptable therapy at present.

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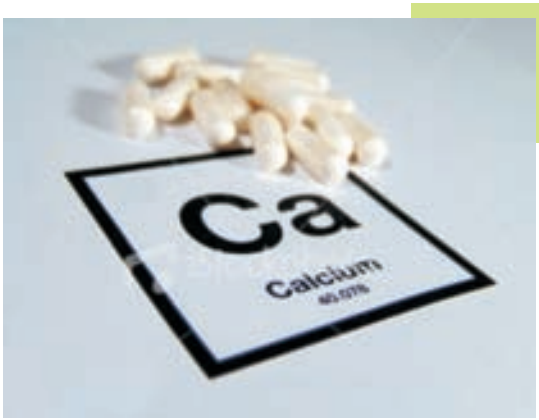

Dr. B. K. Shah
Phone: 079-65426446
Email: drbkshah20@yahoo.com

Management of Osteoporosis: Beyond Calcium Family

Dr. Rajesh Soneji
Ahmedabad

It has been reported that Indian women aged 30-60 years from low income groups, BMD at all the skeletal sites were much lower than values reported from developed countries, with a high prevalence of osteopenia (52%) and osteoporosis (29%) thought to be due to inadequate nutrition and hence it is important to focus on management of ostepotrosis[1].

In addition to lifestyle changes such as improved diet and increased exercise, there are a number of effective, well-tolerated therapies that may dramatically reduce patients' risk of fracture. It would be interesting to note that in the pyramidal approach (Figure 1) - the third level includes pharmacotherapeutic interventions to improve bone density and reduce the risk of fracture. Fortunately, several other options for pharmacological intervention have been demonstrated to decrease the risk of fractures in randomised studies, beyond calcium family. Anti-resorptive and anabolic classes of drugs are primarily meant for prevention and treatment of osteoporosis. Anti-resorptive agents such as Bisphosphonates, selective estrogen receptor modulators (SERMs), Selective Tissue Estrogenic Activity Regulator (STEAR), calcitonin, teriparatide, and estrogen (Hormone Therapy) reduce the risk of fracture[2].

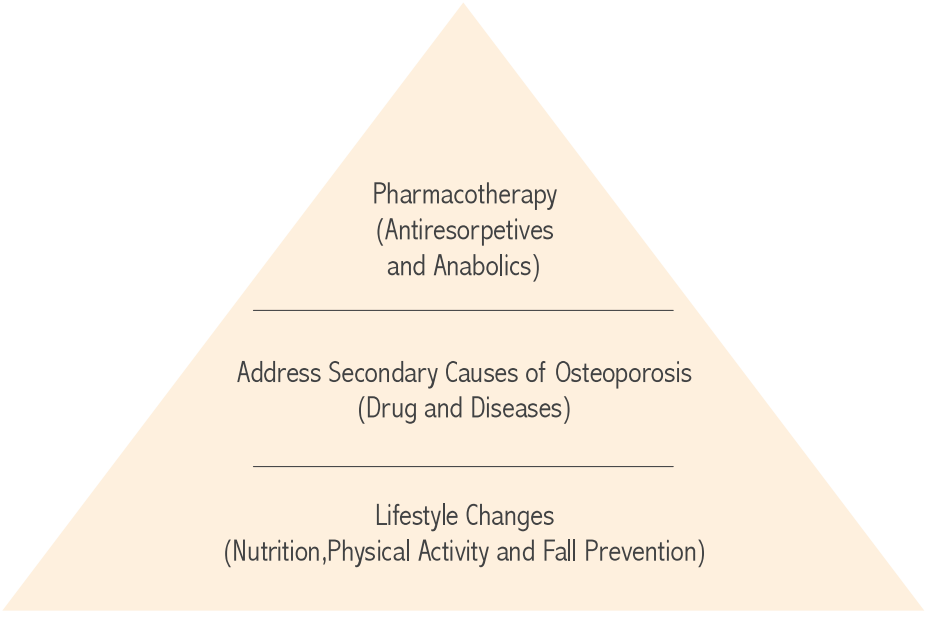

Figure 1 : Pyramidal Approach in treatment of bone disease

Bisphosphonates: Bisphophonates are synthetic analogues of pyrophosphate that inhibit osteoclasts. Several bisphosphonates (etidronate, alendronate, risedronate, ibandronate and pamidronate) have been demonstrated to decrease the occurrence of vertebral fractures by approximately 50%. When bisphosphonates are taken orally, the most prevalent side-effects are abdominal pain, nausea, dyspepsia and heartburn, but in many of the placebo-controlled trials the frequency of these side-effects has been similar in the placebo and bisphosphonate groups. Erosion or ulceration of the oesophagus may occur in rare cases during treatment with aminobisphosphonates.. With intravenous administration, flu-like symptoms and low-grade fever may be seen for 1-2 days in a minority of patients2 . Use of bisphosphonates beyond 3 Years is recently being questioned.

SERMs: Raloxifene (60 mg once daily) is the only SERM currently approved for the prevention and treatment of osteoporosis. It acts as an estrogen agonist on bone and lipid metabolism and as an estrogen antagonist in the breast and endometrium. Raloxifene is effective in preventing postmenopausal bone loss and reducing the risk of vertebral fractures by 30% in patients with prevalent vertebral fractures and 50% in patients without a prior vertebral fracture over 3 years. Reduction of nonvertebral fractures has not been demonstrated[2]. Only noteworthy side effect is VTE.

Calcitonin: Calcitonin is a peptide produced by thyroid C cells that inhibits bone resorption by inhibiting osteoclast activity. Salmon calcitonin is FDA-approved for the treatment of osteoporosis in women who have been postmenopausal for 5 years. It is usually delivered as a daily intranasal spray that provides 200IU of the drug. One trial showed that the intranasal formulation reduced vertebral fracture by 33% to 36%, but an effect on nonvertebral or hip fracture risk was not observed. Calcitonin is generally considered safe, although some patients experience rhinitis and, rarely, epistaxis[3].

Teriparatide: It is a recombinant formulation of parathyroid hormone that increases bone mass and improves bone microstructure. Studies in postmenopausal women have shown, a subcutaneous once-daily dosage of 20µg teriparatide decreased the occurrence of new vertebral fractures by 65% and nonvertebral fracture by 53% after a mean of 18 months of therapy. Teriparatide is approved for administration as an once daily 20µg subcutaneous injection into the thigh or abdominal wall for <2 years. Teriparatide is associated with only minor side effects, including nausea and headache. Hypercalcemia is usually mild and transient[2].

STEAR: Tibolone belongs to a new class of compound known as STEAR. Tibolone has been widely accepted as remedy for vasomotor symptoms and for prevention of bone loss. Studies over the past 25 years have documented its effects on bone mineral density in younger and older women. The unique mode of tissue selective action translating to clinical benefit in postmenopausal women makes it promising. Tibolone (2.5mg/daily) reduces bone turnover substantially (about the same amount as hormone therapy). Increases in bone mineral density (BMD) accompany this reduction in bone turnover, but like all other antiresorptive therapies, reduction in fracture risk (i.e. 50%) is always greater than would be predicted from BMD change. Now that fracture efficacy has been added to the list of tibolone's documented bone benefits, physicians must consider this in the overall risks and benefits of its use[4].

HT (Hormone Therapy): Based on updated evidence5 on effectiveness, cost and safety, HT is also an appropriate first-line therapy in postmenopausal women presenting with an increased risk for fracture, particularly under the age of 60 years and for the prevention of bone loss in women with premature menopause. Details of HT. for Bone Health is being discussed elsewere separately in this issue.

Strontium ranelate

The divalent cations of stabile strontium isotopes may be administered orally as strontium ranelate. Strontium is incorporated into bone and seems to posses dual modes of action: it stimulates bone formation and decreases bone resorption. These effects seem to be mediated by the calciumsensing receptor. In vitro strontium has affinity to this receptor and displays calcimimetic effects. The detailed mechanism of action, however, remains unknown. In patients with osteoporosis, strontium ranelate (1-2 g/day) increases biochemical markers of bone formation and reduces markers of bone resorption.

During treatment, strontium ranelate increases BMD by 14.4% at the lumbar spine and 8.3% at the femoral neck after 3 years. These results, however, should be interpreted in light of the stronger X-ray attenuation (higher atomic mass) of strontium compared with calcium. Thus, approximately 50% of the increase in BMD seems to be to be attributable to the physical properties of strontium within bone.

Strontium ranelate has few side-effects. Diarrhoea may initially be seen but often subsides. A small but significant incidence of thromboembolic diseases was seen, but the physiological basis for this remains unknown. Treatment may increase serum levels of creatine kinase, although this is not related to clinical events.

Future options

An array of new anticatabolic drugs is under development. First, very potent bisphosphonates such as ibandronate and zolendronate may allow once-a-month or once-a-year administration. This may improve compliance considerably, but the antifracture efficacy of these regimens has not yet been documented. In addition, high dosages of vitamin K may have positive effects on bone health. Moreover, advances in molecular biology have identified an array of potential targets for new drugs such as integrins, osteoprotegerin, RANK-L and osteoclast-specific chloride channels that may decrease osteoclastic activity via new mechanisms of action. New anabolic drugs under development include PTH(1-84) and PTHrp. With better knowledge of the molecular pathways mediating the effect of PTH, it is hoped that non-peptide drugs with a similar effect allowing oral administration may be developed. Also, growth hormone and recombinant insulin-like growth factor-I/insulinlike growth factor binding protein-3 complex may be beneficial.

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Dr. Rajesh Soneji
Phone: 079-25323454; 98240 47621
Email: soneji@icenet.net

Good and bad news about hormone therapy (HT) in osteoporosis

Dr. Urvashi P. Jha
Dr. Swasti
New Delhi

Osteoporosis is a condition characterized by low bone mineral density (BMD) and deterioration of the bone micro-architecture leading to increased fracture risk and bone fragility. It has emerged as a major public health hazard in India. Hormone therapy (HT) had been the cornerstone for the prevention of osteoporosis until 2002. After the release of the WHI results the status of HT use changed.

Estrogens and bones are old friends. The osteoprotective benefits of estrogen replacement therapy (ERT) were well established.

Women on HT have been shown to have a statistically significant change in the bone mineral density (BMD)[1]. In all the studies, the spine appears to be the most sensitive to estrogen followed by distal radius, with the hip proving the least sensitive.

However, change with an increase in BMD does not necessarily translate into a decrease in fracture risk.

The studies in the past confirmed that the earlier a woman was started on estrogen and progestin therapy (EPT) the better, as more osteoprotection is achieved by early initiation of therapy.

Delaying the start of conventional EPT to nine years after menopause was seen to increase the odds ratio for hip fractures to 0.62 (0.33-1.18) from 0.35 (0.24-0.54) in current users as was shown by the Swedish Hip fracture Study Group[2].

However, a 4% increase in BMD with EPT had also been demonstrated in elderly women (over age 65) started on continuous low dose CEE (0.3 mg/day) combined with 2.5 mg MPA[3]. This was a larger response than typically seen with early menopausal women (50-55 years)[3].

Estrogen replacement in women over 65 years led to a one-third reduction in non-vertebral fractures[4]. The reduced risk of vertebral fractures was similar to hip fractures in women on estrogen progestin replacement in the Women's Health Initiative (WHI) study[5].

The estrogen and progestin combined arm of the WHI trial found significant reduction in total fracture risk among healthy women on estrogen and progestin (hazard ratio HR 0.76, adjusted confidence interval CI 0.63-0.92)[6]. However, this reduction "did not reach statistical significance"[6].

In the estrogen only arm of the WHI trial also though there was decreased fracture risk this was not seen to be statistically significant[7].

The un-blinded follow up study Heart and Estrogen/progestin Replacement Study-II (HERS II) reported no reduction in hip, vertebral, wrist or total fracture with combined estrogen and progestin therapy[8].

Today, hormone therapy (HT) is recommended for use in symptomatic menopausal women largely for symptom relief (level Ia recommendation)[9]. The U.S. Preventive Services Task Force (USPTF) recommends that HT

(combined estrogen and progestins) should not be used for prevention of chronic conditions in menopausal women (grade D recommendation)[10].

"The American Association of Clinical Endocrinologists (AACE) also recommends against prescribing HT to asymptomatic women to prevent or treat osteoporosis or for prevention of heart disease or other chronic medical problems"[11].

To summarize, it is now recommended (post WHI trial) that conventional EPT should be initiated for its osteoprotective action only in women with other menopausal symptoms and not for prevention and treatment of osteoporosis alone.

In the elderly at 65, with other options available for osteoprotection unless the reasons for selecting estrogen progestogen are compelling, the option of combining biphosphonates with local estriol therapy for genitourinary effects may be more prudent.

Postmenopausal women using estrogen therapy for more than 7 years have a 50% lower chance of osteoporotic fracture than non-users[11].

An enhanced effect on BMD has been demonstrated by combining CEE with biphosphonates[12].

Osteoprotective benefits have similarly been demonstrated also with Tibolone[13] and Raloxifene[14].

Tibolone is a gonadomimetic steroid with a combination of estrogenic, progestogenic & androgenic activity. It has been demonstrated to be as osteoprotective as other forms of hormone therapy if not more[15]. Tibolone has been demonstrated to cause a 50% decrease in fractures[16].

The MORE (Multiple Outcome of Raloxifene Evaluation) trial showed a 30-50% reduction in the risk of vertebral fractures with raloxifene usage[17]. 60 mg/day of raloxifene use causes less reduction in vertebral fractures as compared to 120 mg/day (RR 0.7 vs 0.5)[17].

Data suggest that there may be additive effects of raloxifene with alendronate[18].

Conclusive data regards phytoestrogens is not available regards osteoprotection and decreased fracture risk and hence they cannot be recommended for osteoprotection.

Summary statement

The good news is that hormone therapy (estrogens, tibolone, raloxifene) does lead to both osteoprevention and osteoprotection with increase in BMD and decreased fracture risk. The bad news is that it can no longer be used as first line therapy for osteoporosis if the woman is not otherwise symptomatic from estrogen deficiency in lieu of the increased associated risks of thrombosis and stroke. Unfortunately no level I evidence has demonstrated advantages of prevention of other chronic conditions with hormones to justify its use as a first line osteoprotective agent.

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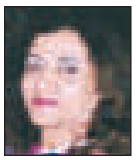
Dr. Urvashi P. Jha
Phone: 011-24335890
Email: urvashipjha@gmail.com

Strong Bones Exercies Programme



Dr. Maninder Ahuja
Faridabad

My only fear is that I may live too long. This would be a subject of dread to me.
-Thomas Jefferson.

This dread in relationship to menopause is only when one has poor quality of life because some life style modifications were not started early at 35years of age itself and then this physiological phenomenon of menopause is turned into a pathological one and nightmare starts. So if one wants good quality of life after menopause, then exercise is a very vital component ,to have overall fitness and for prevention of osteoporosis.

Some Facts:

Decreasing estrogen concentrations after menopause can cause a decline in bone mineral density, which can lead to osteoporosis.[1,2,3,4]

Only about 38% of women over age 19 exercise regularly. But fitness and exercise are critical in the menopausal years, when a woman is at a dramatically increased risk for osteoporosis and fracture, heart disease, and chronic diseases such as diabetes. From age 35 onwards, women lose bone mass at a rate of about 0.75% to 1% per year, and the loss increases to 2% to 3% per year at menopause, most markedly from the lumbar spine.

Exercise: Regular exercise has effects on bone density, size, and shape, resulting in substantial improvements in mechanical strength.Previously it was thought that any type of exercise would help but now it is known that only weight bearing and resistance exercises would increase BMD.

How weight bearing exercises help?

1. One mechanism through which physical activity could increase bone strength is by increasing muscle mass. Lean body mass is thought to increase bone mineral density through mechanical loading of the skeleton.[5]
2. With exercise, small gains in bone mineral can result in large improvements in bone strength,because new bone formation is often localised to bone surfaces where mechanical strains (stresses) were greatest.[6]
3. Hert did studies some 30years back[7] which proved that Bone tissue responds to dynamic rather than static loading. High impact exercises that produce large rates of deformation of the bone matrix best drive fluid through the lacunar-canalicular network system. Thus increasing loading rate is one step toward more effective application of mechanical forces to promote osteogenesis.

   It is important to have rest inbetween short vigorous skeletal loading for maximum osteogenic effect of exercise.
4. After 24 hours of rest, 98% of bone mechanosensitivity returns[8] Another practical thing is doing exercises after period of rest so that it would have maximum effect.So it is better to do weight bearing exercises on alternate days and weight should be gradually increased.[9]

5. So weight-bearing exercises are advocated as a strategy for preventing osteoporosis In 2000, a review of 24 randomized controlled exercise trials in postmenopausal women found that both impact and nonimpact exercise prevented bone loss in the lumbar spine and femoral neck. [13]

6. Early start in adolescent period to prevent osteoporosis.Although exercise has clear benefits for the skeleton, engaging in exercise during skeletal growth is unequivocally more osteogenic than exercise during skeletal maturity.[10] The biological mechanisms for this phenomenon are not yet fully understood but are probably related to the fact that, during growth, the bone surfaces are covered with a greater proportion of active osteoblasts than after skeletal maturity. Periosteal expansion occurs predominantly during growth, and consequently the childhood and adolescent years provide a window of opportunity to significantly enhance periosteal growth with exercise.Vigorous exercise during growth and young adulthood may well reduce fracture risk in later decades[11].

Various studies have conclusively proved effectiveness of resistance training and weight bearing exercises for increasing BMD and reversing sarcopenia and some of them are highlighted.

COCHRANE REVIEW

Aerobics, weight bearing and resistance exercises are all effective in increasing the BMD of the spine in postmenopausal women. Walking is also effective on the hip.[16]

But for walking to be effective it has to be very brisk walking at the rate of 5-6 kms/hr

BEST STUDY(bone, estrogen strength training)
Previously it was thought that any type of exercise was helpful, but now we understand that resistance and weight-bearing exercises are essential."

"What sets this regimen apart is the six specific exercises that help build bone in the wrist, hip and spine - three key fracture sites," The prescribed exercise program was 2 sets of 6 to 8 repetitions of exercises at 70% to 80% of 1 repetition maximum,with 7-10 min of cardiovascular training, 3 times weekly, 60 to 75 minutes per session in a community facility with a trainer and was composed of

1. Leg press,
2. Military press,
3. Seated row,
4. Squats,
5. Back extension, and
6. Lateral pull down.

Adjusted multiple linear regression models revealed that ExFreq was positively and significantly related to changes in femur trochanter (FT) and neck (FN), lumbar spine (LS), and total body (TB) BMD.

Back exercises for kyphosis:

The thoracic kyphosis of estrogen-deficient women has been found to be directly correlated with weakness of the back extensor muscles, and increasing the back extensor strength has been shown to decrease the kyphosis.this was prospective 10yrs trial. In this instance, when the torso is carried flexed forward, the patient will need to retrain the extensor muscles of the spine with isotonic resistance exercises. This is most effective when done in an upright, weightbearing position.

Exercises which are required are seated rows and wide angle pulley press.[14]

Physical activity is inversely related to hip fractures:[15]

Hip fracture incidence and hours per week of physical activity

Activity MET-hours/week

Age-Standardized Adjested*	>3	3-8.9	9-14.9	15-23.9	≥24
	118.0	82.4	70.2	52.7	46.6
	230	184	155	124	100

per 100000 women per year

*Hip fracture incidence estimated for while women 65 years old who have never smoked do not use postmenopausal hormones, do not drink alcohol, and are at the median level for all other covanatos.

There are observations that aerobic exercise, even exercise accompanied by weight loss in obese women is not associated with loss of total body bone mineral density or content .And this is important as it is vital to confirm that activities (e.g., exercise) recommended to improve certain aspects of health (e.g., cancer risk) are not detrimental to other components of health (e.g., bone health). [12]

Prescription of exercise for strong bones:

1. On alternate days resistance and weight training*3 days a week.By rotation exercise for all muscle groups should be done.
2. Brisk walking or aerobic exercises like cycling ,tread mill,gardening, dancing *3 days in a week
3. Yoga as a stretching exercise can be done either early in the morning or after regular exercise
4. Meditation once in a week.
5. Calcium 1500 mg/day
6. Vit D400-600iu/day
7. KEEP SMILING!

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Dr. Maninder Ahuja
Phone: 0129-2285857
Email: drmaninder_ahuja@yahoo.co.in

FAQ'S
ON OSTEOPOROSIS

Dr. Sonia Malik
New Delhi

1. What are the various types of osteoporosis seen in women them and why is osteoporosis more common in women ?

Type I osteoporosis involves loss of mainly trabecular bone, which is commonly seen in the spine and the wrist, and its loss is accelerated at menopause. The incidence in women is eight times higher than that in men. The frequency of postmenopausal osteoporosis accounts for the overall female-male ratio of 2:1 to 3:1.[2]

Type II osteoporosis or "senile osteoporosis" is loss of both cortical and trabecular bone, it commonly affects the hips, proximal end of the humerus, tibia, and pelvis and usually affects people over 70 years of age.

Secondary or type 3 osteoporosis as it is often called can affect men and women of any age and caused by the prolonged intake of drugs like glucocorticoids or diseases like Cushings syndrome.

Women at menopause, and for next 10 years, lose bone at an accelerated rate-about 3% per year compared to with 0.03% during the preceding decade. This is mainly due to increased bone resorption, as a result of the withdrawal of estrogen which normally restrains osteoclastic activity. Estrogen is involved in skeletal growth and the closure of bone epiphysis in adolescents, and the lack of estrogen results in bone loss after menopause. In some cases this process is exaggerated and results in osteoporosis and skeletal failure. Osteoporosis develops less often in men than women because bone loss starts later and progresses more slowly in men, and there is no period of rapid hormonal change and accompanying rapid bone loss. By age 70, both men and women are at equal risk to develop the disease because of decreased bone formation and also decreased vit.D formation by the kidneys.

2 What is the Indian Scenario? Is it different from the global scenario in ant way?

There are few epidemiological Indian studies on osteoporosis probably because of lack of awareness but the Osteoporosis Society of India reports that about 50% post menopausal women suffer from it accounting for 30 million women. The rest of the osteoporotic population is composed of men or children.[4] An estimated 61 million people in India are reported to be affected by osteoporosis as the life span has improved and they are low in bone density than the North American and Europeans. It is also reported that osteoporotic fractures occur 10-20 years earlier as compared to Caucasians. This phenomenon has been reported in Indians living abroad as well. It has been attributed to vit.D deficiency which leads to a lower bone mass early in life. The commonest reported fracture is that of the hip since admission is not required for others. Based on the studies on hospital admissions, hip fracture occurs more frequently in men than in women. The Osteoporosis Society of India also reports that lower hospital attendance and health service utilization by women in India, especially in advanced age, which is a reflection of the socioeconomic inequities of Indian society, may be the main reason behind the "skewing of data"[4]

3. What is a "risk score" for osteoporosis?

Risk score is the probability & predictability for the patients who undergo clinical and laboratory assessment for suspected osteoporosis.

T score (WHO standard reference	Fracture risk	Action
Normal T > -1.0 Low bone mass (Osteopenia) T -1.0 to -2.5	Low Above average	Lifestyle advise Lifestyle advise. HRT especially in women aged 50 - 60 years. Calcium and Vitamin D supplementation.
Osteoporosis T < -2.5 Treat	High	Lifestyle advise Calcium and Vitamin D supplementation
Established osteoporosis T < -2.5 plus one or more fractures	Very high	Lifestyle advice. Pain control. Exclude secondary causes. Treat (Calcium Vitamin D). Consider referral.

Factor	Score
National Osteoporosis Foundation (NOF), test if score ≥1	
Age ≥65 years	1
Weight <57.6 kg	1
History of fracture	1
Family history of fracture	1
Current cigarette smoker	1
Simple Calculated Osteoporosis Risk Estimation (SCORE), test if score ≥6	
Race not black	5
Rheumatoid arthritis present	4
History of fracture at wrist, hip of rib	4 each
Age ≥65 years	3 times first digit of age
Oestrogen therapy never used	1
Weight	(-1 times weight in lb/10)

Osteoporosis Risk Assessment Instrument (ORAI), test if score ≥9	
Age 55-64	5
Age 65-74	10
Age 75+	15
Weight 60-70 kg	3
Weight <60 kg	9
Not currently taking Oestrogen	2
Age >65	1
Weight <63.5 kg	1
Never used OC or Oestrogen therapy for at least 6 months	1

Bone densitometry using dual energy X-ray absorptiometry (DXA) is the 'gold standard' for osteoporosis diagnosis. However, mass screening for osteoporosis has not been recommended, and no consensus has been reached regarding specific screening programs. Recently, a Simple Calculated Osteoporosis Risk Estimation (SCORE)3 was developed by a Canadian group to identify postmenopausal women likely to have low BMD (< or > -2.0 SD of the young adult normal), who may be selected for DXA testing. This instrument uses a case-selective approach to screen for osteoporosis by summing a score based on: age, race, rheumatoid arthritis, history of non-traumatic fracture over 45 years of age, estrogen use, and weight. In a Canadian multicentric study, SCORE was validated using 398 postmenopausal women at least 45 years of age. At the recommended threshold of 6, SCORE had a sensitivity of 90%, specificity of 32% and a positive predictive value of 64%. More studies are required to validate this system. Presently, we go by certain factors which a indicate possibility of Osteoporosis. These can be non- modifiable or potentially modifiable

Non-Modifiable

* Age
* Female Sex
* Maternal family history of hip fracture
* Low birth weight
* Disease predisposing to osteoporosis

Potentially Modifiable

* History of falls
* Body mass index
* Drug therapy (e.g. corticosteroid use, etc)
* Primary or secondary amenorrhea
* Early menopause
* Smoking
* Alcohol
* Dietary calcium and vitamin deficiency

4. How can you diagnose early osteoporosis?

It is important to remember that the peak bone mass develops in the 25-35 yrs. And ostomalacia is also very common in the country. Hence all patients should be asked about symptoms of bone deficiencies. It is always a clinical suspicion first followed by relevant history and lab tests.

A careful history of a patient in the menopausal age group may suggest weakness of the bones.

These have also been identified as major and minor risk factors (table)[5]

Back pain or increased thoracic kyphosis or someone in the family has noticed that the height has reduced. This is the typical picture, but sometime the first clinical picture is a low energy fracture of the distal radius or one of the other bone ends.

X-ray may show wedging or compression of one or more vertebral bodies. Most of the time the patients presenting with unprovoked back pain may just show rarefaction of the trabecular pattern or ground glass appearance. Bony tenderness can be elicited, with normal or low normal serum Calcium because the rate of bone turnover is either normal or slightly increased. Bone Mineral Density can be performed to diagnose osteoporosis based on the WHO criteria. Once the general diagnosis has been established, screening tests should be preformed to rule out causes of secondary osteoporosis.

Table 3: Factors that identify people who should be assessed for osteoporosis

Major risk factors	Minor risk ractors
• Age ≥ 65 years	• Rheumatoid arthritis
• Vertebral compression fracture	• Past history of clinical hyperthyroidism
• Fragility fracture after age 40	• Chronic antivonvulsant therapy
• Family history of osteoporotic fracture (especially maternal hip fracture	• Low dietary calcium intake (see nutrition section)
• Systemic glucocorticoid therapy of >3 months duration	• Smoker
	• Excessive alcohol intake
• Malabsorption syndrome	• Excessive caffeine intake (see nutrition section
• Primary hyperparathyroidism	• Weight >57 kg
• Propensity to fall	• Weight loss >10% of weight at age 25
• Osteopenia apparent on x-ray film	• Chronic heparin therapy
• Hypogonadism	
• early menopause (before age 45)	

CMAJ • NOV. 12, 2002; 167 (10 suppl)[5]

5. What is BMD? What are the various methods of doing BMD?

Bone Mineral Density (BMD) is based on the principle that a beam of energy is attenuated as it passes through a bone, and the degree of attenuation is related to the mass and mineral content of the bone. BMD is expressed in grams per unit area (or unit volume in the case of computer tomography and is recorded in comparison to the age and sex specific distribution of these values in general public. The measurements are specific for each location (lumbar spine, femoral neck, distal radius, etc). BMD values for the Indian population seem to be different from the WHO standard's 6and further studies are required for the standardization of these values.

The older methods like radiographic absorptiometry, single energy x-ray absorptiometry, quantitative computed tomography are relatively either unreliable or have more radiation hazard, and are hardly used. Dual energy x-ray absorptiometry is the only most reliable method to measure the bone mass. Ultrasound based BMD scans are only used as screening methods in large population and not for diagnosis.

6. What would you prescribe as first line therapy for prevention of osteoporosis today?

Every one is at risk of developing osteoporosis as age progresses and diet patterns change. Women approaching menopause should be advised to maintain adequate doses of Calcium and Vitamin D, good level of exercises, and to avoid smoking and excessive alcohol and other changes in life style. Recommended daily elemental calcium intake in menopausal women is 1500 mg/day and that of vitamin D is 800 IU[7]. Exercise reduces the risk of falling by 10%, and balance training programs reduces the risk by nearly 20%

7. What is the current status of HRT for osteoporosis prevention?

HRT is the most effective way of maintaining bone mineral density and reducing the risk of fractures after menopause; when treatment is stopped, bone loss proceeds as usual rate. How ever, post WHI, HRT has taken a back seat in prevention of osteoprosis in women because of the known draw backs, notably the risk of post menopausal bleeding, fear about an increase in the incidence of stroke, breast and uterine cancer after long term treatment. The initiation of standard-dose HT is not recommended for the sole purpose of the prevention of fractures after the age of 60 years except in patients of premature menopause. The continuation of HT after the age of 60 for the sole purpose of the prevention of fractures should take into account the possible long-term effects of the specific dose and method of administration of HT, compared to other proven therapies8 The protective effect of HT on bone mineral density declines after cessation of therapy at an unpredictable rate, although some degree of fracture protection may remain after cessation of HT For practical purposes today, HRT is encouraged for women with positive risk factors and low BMD on DEXA scanning -especially if there are other reasons for not wanting to prescribe other medication and it is contra-indicated if risk factors for breast cancer are identified.

8. How do alternative therapies like exercise help in bone building?

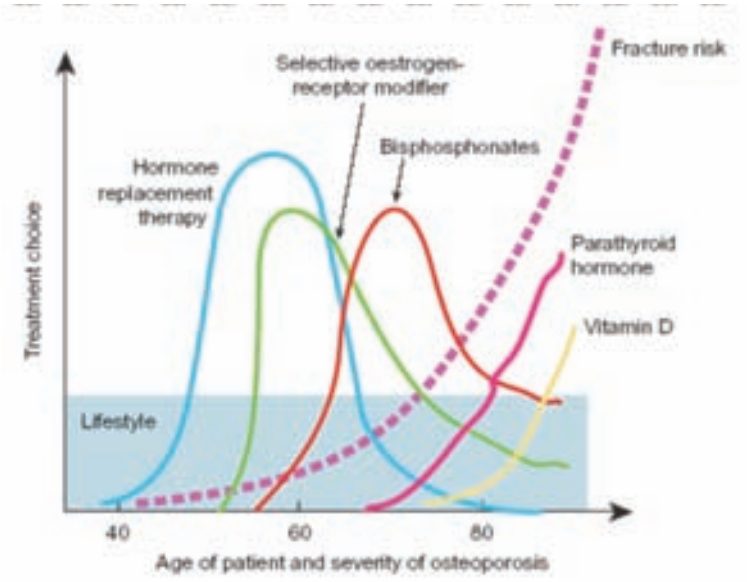
Exercise is now the primary prescription for almost all disorders affecting men and women. It should no longer be considered as "alternative therapy" Exercises benefit skeletal structure and strength. Wolff's law states that a stress or mechanical loading applied to the bone by muscles and tendons has a direct effect on bone formation and remodeling. Various activities affect different parts of the skeleton differently, depending on the pattern of physical loading on specific bones. Physical activity variations include type, frequency, duration, intensity, and age of onset. An exercise must overload bone to stimulate it. (i.e., to increase bone density and/or bone strength and quality). Also physical exercises lead to better muscle tone and help prevent falls or at least save population from fractures. A good exercise programme must cater to muscle strengthening, weight bearing and prevention of falls in older women.7

9. Are their any guidelines for therapy in Osteoporosis? Is there a difference in the anti fracture therapies used for the disease?

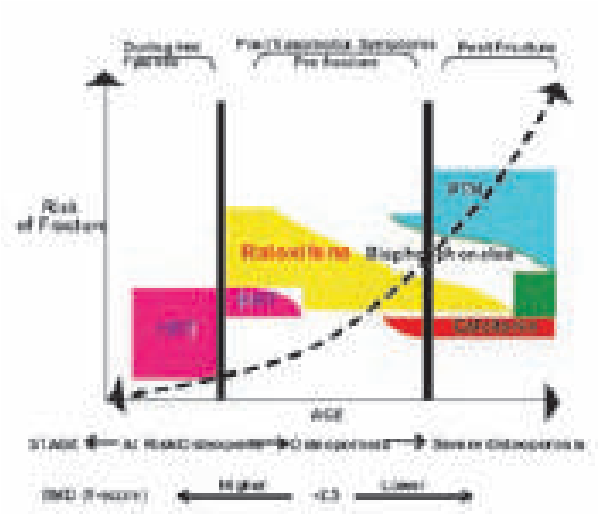
The Indian Menopause Society recommends that osteoporosis therapy should be considered in women with the following categories:

(a) all postmenopausal women with total hip or spine T scores below -2.5.
(b) all postmenopausal women with total hip or spine T scores from -2.0 to -2.5 and at least one additional risk factor for fracture.
(c) all postmenopausal women with osteoporotic, vertebral fracture (no bone mineral density is needed).

At present, most pharmacological therapies for treating osteoporosis aim to inhibit excessive bone resorption. These agents (fig.2), which include bisphosphonates and raloxifene, as well as HRT, reduce the rate of bone turnover (particularly bone resorption), reduce bone loss and increase BMD measurements. In randomised studies of varying quality, these agents have been shown to reduce fracture risk. In postmenopausal women with low BMD who have or have not had previous vertebral fracture, hormone replacement therapy (HRT), raloxifene and bisphosphonates such as alendronate and risedronate have each been shown to increase BMD and reduce fracture risk by between 30% and 60%. Parathyroid hormone (PTH [1-34]), which stimulates bone formation, has also been shown to increase BMD, improve bone structure, and decrease the risk of vertebral and non-vertebral fractures. The efficacy of combination therapies has also been studied and it is observed that each has a different anti resorbtive effect. Their action is also different for different sites of osteoporosis. In addition, due to the different side effects (e.g. raloxifene causes hot flashes), different molecules are selected accordingly (fig.3).[9,10]



Therapeutic Options for Osteoporosis (MJA 2004; 180 (5 Suppl): S18-S22)



Osteoporosis Therapy Algorithm
(Ref: Kaplan B., New Trends in Osteoporosis and Management Address; April 2003)

10. What are the new drugs for osteoporosis management?

Calcitonin is a natural hormone produced by thyroid gland prevents bone resorption. Calcitonin is available in form of injection and nasal spray. Administration of calcitonin to patients with osteoporosis increases bone mass minimally but reduces the risk of vertebral fractures by about 33%. It also has some anaelgesic properties reducing back pain in about 80% of patients.

Teriparatide is a short form of parathyroid hormone which is the chief regulator of calcium metabolism. Given in the form of injections daily it stimulates new bone formation. Treating patients with Teriparatide for a period of 18 months, increases bone mass by about 10% - 14% in the spine and 3% to 5% in the hip. It also reduces the risk of fractures in the spine by 65% - 70%.

Use of combinations has been accepted to be the best way treating osteoporosis. Combining bis-phosphonates with estrogens or with raloxifine

11. How would you follow up a patient of osteoporosis? Does BMD decline indicate treatment failure?

After diagnosis and preliminary trial of medications, it is important to bring the micro-fracture pain under tolerance level followed by trial of isometric exercises. If all is going well, patient can be followed yearly for five years with all medications on flow (Calcium, Vitamin-D and Bis-phosphonates). Raloxifine is added for all the post menopausal women. Spurts of pain can be managed by intermittent use of Calcitonin injections or nasal spray for period of 30 injections or 3 months of nasal spray. If Teriparatide has been started then it must continue for period of 18 -24 months. Any worsening symptom should invite full spectrum investigation to rule out any secondary cause which might crop up now, or else same medications may be continued. After 5 years the calcium and vitamin D can continue on daily basis but the anti-resorptive drugs can be given for a period of 9 months in a year and yearly follow up.

None of the drugs except Teriparatide, can improve the BMD which is ever declining as it is a degenerative process. So the BMD will deteriorate but the rate of deterioration should not be more than 0.3% per year. This rate of deterioration is not treatment failure, it is physiological.

12. What are the indications for surgical management?

Intractable pain in spite of conservative treatment, or progressive deformity call for a surgical opinion. The options available are vertebroplasty and kyphoplasty. These are simple procedures in which bone cement is put inside the involved bone to immediately support the trabeculae resulting in freedom from pain instantly. In kyphoplasty the bone is expanded with the help of a balloon compacting it against the intact cortical perimeter and the residual cavity so created is filled with the bone cement

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Dr. Sonia Malik
Phone: 011-26894767
Email: sm_doc@rediffmail.com

A case of Osteoporosis due to overuse of GnRha during treatment for Endometriosis and Infertility.

Dr. Rishma Dhillon Pai
Dr. Hrishikesh D. Pai
Mumbai

38 years old infertile woman had endometriosis since 5 years and found to have bilateral 5-6 cm Endometrioma. Laparoscopic cystectomy was performed. Subsequently tried for conception with three failed attempts at IUI. Followed this with an attempt of IVF. GnRha depot was used for 2 months, for down regulation. IVF attempt failed, was repeated with a similar protocol after 1 month. Patient then stopped all treatment.

She came back after one year to start treatment. Sonography showed bilateral endometriomas. She refused surgery and therefore GnRha depot was advised for 3 cycles and IVF. Then patient went abroad and on the advice of American doctor continued depot GnRha for 6 months. A repeat IVF was performed. The patient conceived but had a missed abortion at 2 months.

At this time she started complaining of joint pains, backache and leg cramps. DEXA was done in view of GnRha usage. It showed osteoporosis at the lumbar spine and osteopenia of the hip and wrist..

She was put on continuous oral progesterone for endometriosis and risedronate, 35 mg was started once a week. Calcium 1000 mg daily and advised daily walk for 40 minutes, and to quit smoking (she smoked 6 - 8 cigarettes a day). All the risk factors of osteoporosis and the subsequent treatment and care were explained to her.

Discussion: Matsuo (1) showed that Bone Marrow Density significantly decreased after 24 weeks of treatment with GnRha and remained below baseline at 12 months after the treatment period. To minimize bone loss, add back with sex steroids or bisphosphonates is being tried.

In a comparison of 6 months of Leuprolide acetate depot 3.75 mg monthly with and without add back of oral estriol 4 mg / day Nakayama (2) showed the bone mineral density of lumbar spine on DEXA decreased by 7.5% at the end of treatment in the non add back group, but did not change in the add back group. The levels of bone metabolic markers such as deoxypyridinoline, osteocalcin etc increased throughout the treatment in the non add back group, but were suppressed by the add back therapy.

Norethindrone only 'add back therapy' has been studied by Adashi etal (3) and proved promising in the treatment of endometriosis with GnRha. These reduce some of the side effects of GnRha & provide a medical option for patients who are high risk for surgery.

Ripps etal (4) studied the effects of 6 months of treatment with Leuprolide acetate 3.75 mg every 28 days. Patients who were given alendronate 10 mg daily as add back therapy - showed a mean gain of 1% in lumbar BMD compared significant loss of 3.8% in patients receiving only GnRha.

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Dr. Rishma Dhillon Pai
Dr. Hrishikesh D. Pai
Phone: 098210 16005
E-mail: rishmapai@hotmail.com

FOGSI-Cares-2007: Bidding Adieu

When the current team was installed at the helm of affairs in the golden Jubilee AICOG at Kolkata, we dedicated our term to S. Vivekananda and his words "My name doesn't matter, my work matters".

Paradigm shift from one theme to a philosophy:

To maximize results for the tenure of the current team we announced the philosophy for the year as FOGSI Cares-2007.

FOGSI Cared for dying mothers through JAGRUTI: Mission of awakening the masses:

A 13-episode serial was professionally produced for Radio. It was broadcasted from the radio stations of All India Radio for a period of three months in the states of Bihar, Madhya Pradesh, Rajasthan, Uttar-Pradesh and Jharkhand. This unique effort of FOGSI was appreciated by WHO as well as UNICEF.

Mutually exclusive - Collectively exhaustive:

As promised this year the Vice-presidents handled themes independently. Also, the President-elect, Immediate Past President and other office bearers handled projects as a part of the team. These were guided by the principles of modern management: Mutually exclusive - Collectively exhaustive.

FOGSI cared for academics:

Red-Alert Workmats:

We organized an innovative form of CMEs in this. As they were related to crisis situations in clinical practice we labeled them as Red Alert Workmats. We promised organizing 40 such workmats equitably distributed in all four zones of the country. We are satisfied to report that instead of 40 promised, we have covered 94 societies in this campaign. We extensively used satellites for conducting these Workmats and areas where this technology platform faced a challenge we covered these societies physically visiting them.

Gyan Yatra [Knowledge Pilgrimage]:

Senior teaching faculties went to obgyn departments in different parts of the country and taught. This gave the advantage to P.G. Students of a chance to be exposed to faculties and approach of teachers from other institutions.

Gyan Prakashan:

1. Four issues of FOGSI FOCUS were published during the year. These were on PPH, PIH, Infertility and Osteoporosis in Women.
2. As also promised we published the latest edition of the postgraduate text book in the subject.
3. FOGSI-ROMs: On this unique canvas 3 CD ROMs bearing clips of surgeries were developed. The topics covered were: Urogynecology, Surgical Interventions in PPH and Evolving in Endoscopy.

Energizing in Endoscopy:

In this hysteroscopy training programmes were organized in different societies of FOGSI. The attractive component of these workshops was hands-on training on models

Aakash Gyan [FOGSI-ICOG Satellite School]

In this PG teaching method through the satellite nearly 10 departments were wired. There was a satellite down-linking of PG teaching programme once a month all over the country.

Frontal attack on adolescent anemia [12x12]:

Diagnosis, treatment and awareness camps were organized as promised all over the country by member societies covering nearly 1, 00,000 adolescents. Many societies participated in this progrmame all over the country.

FOGSI cared for the girl child: Say NO to female feticide:

1st July was announced as FOGSI Girl Child Day. Members took a pledge that they will not indulge in any such activity which may reveal the sex of the unborn child or terminate the pregnancy where this has been done. Social actions in the form of rallies, public meetings and discussions were undertaken in this. Many societies participated in this progrmame all over the country

FOGSI cared for its members: FOGSI Health Scheme:

In this unique scheme if any member is struck by designated crippling illness like renal failure, paralyzing stroke, blindness and the like FOGSI will step-in to express a feeling that we are with you and we care for you. A one time lump-sum payment will be done if any of these designated critical and crippling illness strikes a member.

FOGSI cared for its democracy:

Uniform CV with ballot papers:

During the year we developed a mechanism by which a uniform structured introduction of all candidates will now be mailed with ballot papers in the elections. This will give a fair and equal chance to all candidates to present themselves to the voters.

Publication of "Charter of Rights and Responsibilities" as FOGSI member:

A Charter of Rights and Responsibilities of FOGSI members has been declared. It will sensitize members of FOGSI as to their rights and responsibilities. This can take the working of FOGSI to further transparency.

FOGSI cared for the journal:

All articles, papers, cases, etc. published in the journal till date on the website have been digitalized. Also, this has been fortified by a robust search engine wherein you will only have to enter one or two key words and titles of all articles on the subject will tumble down.

FOGSI cared for its website:

The website of FOGSI has been made optimum to meet basic standards. It has been loaded with all possible information including the proceedings of the last AICOG including the papers presented. It is now alive, vibrant, versatile and prolific online office of FOGSI

FOGSI Vision 2027:

We developed a vision for FOGSI during the year. Where do we all together see FOGSI twenty years form now is now identified in FOGSI Vision 2027.

Beyond FOGSI Cares 2007:

We did not stop at the set agenda of working on fulfilling the promises that we had made. But we are satisfied to report that this team went beyond the promises:

Defending members against mob-violence:

Member societies were encouraged to form "crisis-help" team which can rush down to the points where such an incident is occurring. Also, an advisory was sent to all societies to act as a set of guidelines for members of the "crisis-help" team.

Code of Conduct for Electoral Candidates:

A draft Code of Conduct has been evolved by this team for installing highest standards of ethics and behavior of candidates contesting elections for different positions of FOGSI.

Clinical Research training programmes:

Two clinical research training programmes were organized during the year one each in East Zone (Puri) and South Zone (Bangalore to be held in March). This was our attempt to invest in the younger generation for improving the quality of research in the subject in our country.

Epilogue:

As we lay down the office the team of FOGSI 2007, we leave with no regrets or relief, no pain or happiness, no burden or grief but with a Supreme sense of equanimity and poise that has flown down from The Almighty who never left our hand and sailed us through even the roughest of times in the best possible way. We bow our head at the feet of the Omnipotent and Omnipresent. We are satisfied!

Thank You O Holy Mother!

Team 2007

Think of a Woman.
A Smile will light up your face.
She arrives as a daughter enriching
Our lives with her innocence
And wonder. As a sister, caring and
Sharing childhood adventures. As a friend,
A cheer leader for every young dream. As a wife
giving selflessly for the road ahead,
in a new home and family.
As a mother, creating and nurturing life.
As a grandma, blessing our future
With health and happiness.

Let us celebrate the woman as herself,
In the best of health.

"Together we can change
The Women's Life
For Better!"

Feedback Form

Women *and* Osteoporosis

Your feedback is important for us…

You are requested to spare a few minutes & send us your views & suggestions regarding this publication.

	Your evaluation	Your remark
Subjects covered	Excellent/ Good / OK	
As reference on your desk for clinical practice	Excellent/ Good / OK	
As an addition to your library	Excellent/ Good / OK	
Contents by authors	Excellent/ Good / OK	
Printing quality & presentation	Excellent/ Good / OK	
The best chapter you liked as a subject		
The best author you liked as a presenter		
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FOGSI Team 2007 C/o Dr. Atul Munshi
51, Pritrmnagar, Ellisbridge, Ahmedabad 380006 or email to
munshiap@gmail.com; munshiap@yahoo.co.in

thank you

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