Diagnosis and management of osteoporosis- can we make it simple?

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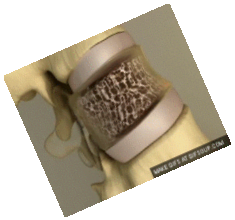


Definition of osteoporosis

Disease definition

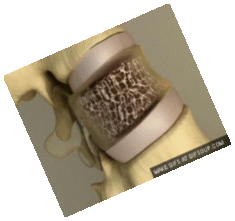
Healthy bone

Osteoporotic bone

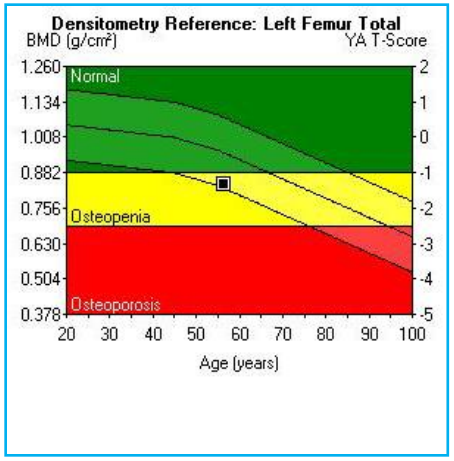
- low bone mass,
- deterioration of bone tissue,
- disruption of bone microarchitecture
- increase in the risk of fragile fractures

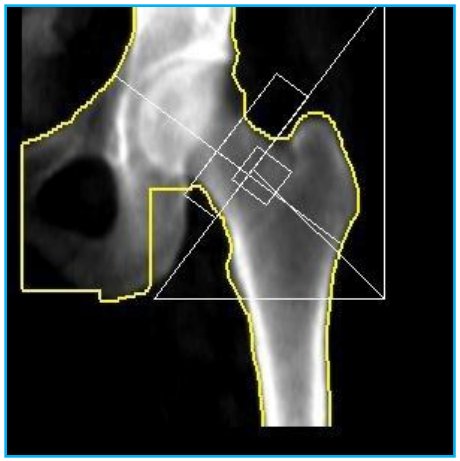
NIH, JAMA. 2001;285:785-795.

Sözen et al. Osteoporosis. Eur J Rheumatol 2017; 4: 46-56.
Indian Journal of Clinical Practice, Vol. 23, No. 12, May 2013.



WHO Definition of Osteoporosis:

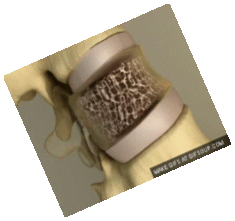




DEFINITION BY DXA SCORING

T score	Category
≥-1	Normal
<-1 to ≥2.5	Osteopenia
<-2.5	Osteoporosis
<-2.5 with fragility fracture	Established/severe osteoporosis

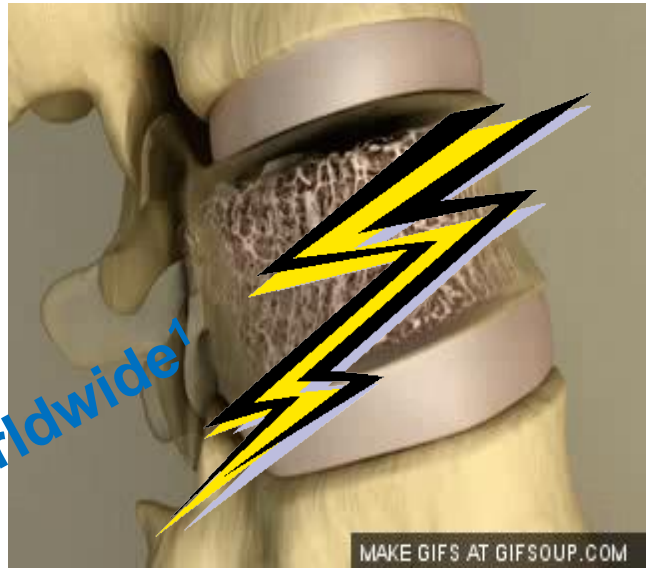
Adopted from Clinician's Guide to prevention & treatment of osteoporosis ,2014,Ver:01. National Osteoporosis Foundation(USA)



Epidemiology

Incidence & Epidemiology

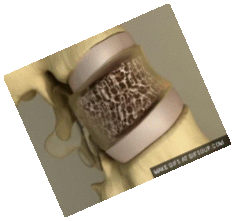
- Osteoporosis is a global major health problem.
- Worldwide, osteoporosis causes more than 8.9 million fractures annually[1,2]
- Osteoporosis affects an estimated 75 million people in Europe, USA and Japan, [1,2,3] 2.2 million in Australia[2,4] and 70 million in China[2,5]
- Diagnosis and treatment increased in Western countries, however, less attention is given in the Middle East and African countries[6]



OP is estimated to affect 200 million people worldwide[1]

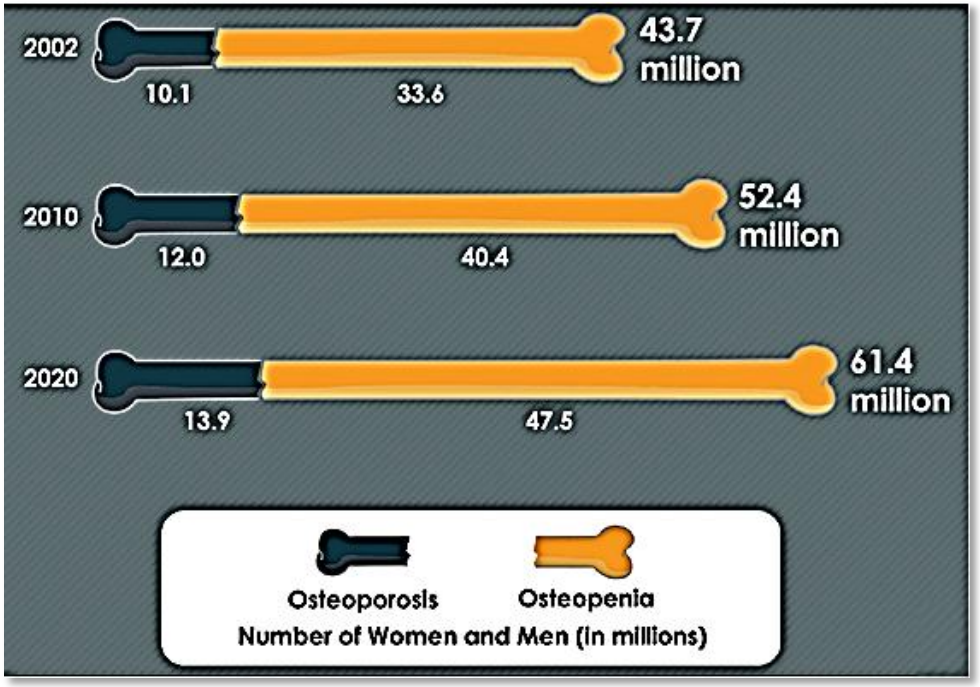
Every 3 seconds an osteoporotic fracture occurs[1,2]

[1]Johnell O, et al. Osteoporos Int. 2006,17:1726.
[2]https://www.iofbonehealth.org/facts-statistics#category-14
[3]EFFO and NOF 1997, Osteop Int. 7:1
[4]Sambrook PN, et al. Med J Aust 176 Suppl:S1.
[5] China Health Promotion Foundation 2008
[6]Vijayakumar R, et al. Journal of Local and Global Health Science 2016:2
EFFO European Foundation for Osteoporosis
NOF National Osteoporosis Foundation
[1]Kanis JA (2007) WHO Technical Report, University of Sheffield, UK



Osteoporosis prevalence

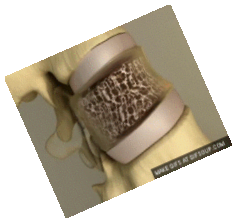
Epidemiology



Projected growth in the US prevalence of osteopenia and osteoporosis. Data from the National Osteoporosis Foundation

The prevalence of osteopenia and osteoporosis is estimated to increase by another **9 million individuals from 2010 to 2020**

Shuler FD, et al., Orthopedics, 2012 – 35. 9: 798-805



OP in special situations:

Clinical manifestations

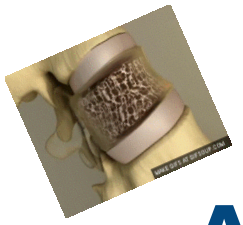
Glucocorticoid Induced OP-

- 50% patients with long term therapy.
- Most rapid loss in first 6-12 month
- Overall prevalence of vertebral fracture is 28%.

- **HIV AIDS &OP**
- patients are at high risk for early OP due to multiple causes.
- 15% of HIV patients have OP
- 3.68 times more prone to OP than normal counterpart.

- **4 types- OP in pregnancy:**
  - Idiopathic OP
  - Transient OP of hip.
  - Post pregnancy spinal OP
  - Lactation associated OP.

N Eng J Med 1997;337:382-387.
J Bone Miner Res 2000;15L993-1000.
Arc Intern Med 2000;160:2917-2922.
Shailesh Hadgaonkar et al. Asian Spine J 2015;9(4):625-628
Top Antivir Med 2013;23(3):115-118



Asian study

- By 2050 more than 50% of all osteoporotic fracture will occur in Asia.

Facts About Osteoporosis

Around the world, at least one in three women and one in five men over the age of 50 will suffer a fracture caused by weak bones.

Fractures result in pain, debilitation and loss of quality of life.

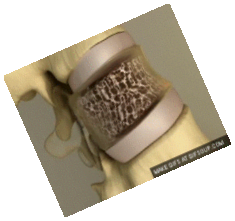
Thirty-three per cent of older adults who suffer a hip fracture become physically impaired and lose their ability to live independently one year after the fracture.

At least one in five will die within the year following fracture.

Vertebral (spine) fractures can cause extreme pain, long or short term disability, dowager's hump, and significant loss in quality of life.

Without treatment, the risk of suffering a cascade of new fractures is very high.

The Asian Audit 2009



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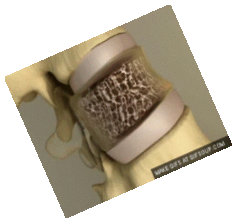
Epidemiology

Mortality & Morbidity:

- Hip fractures result in a 10% to 20% > mortality risk within 1 year.
- Hip fracture vs breast cancer – 2.8%.
- 55% more co-morbidity like pneumonia,

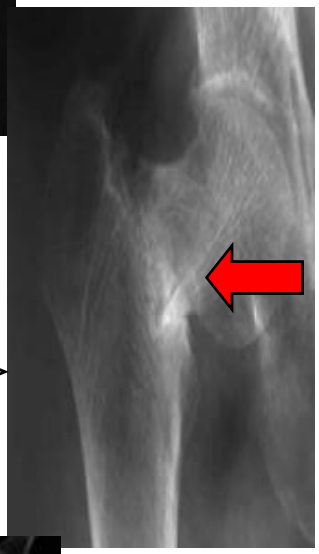
Am J Manag Care 2011;17:S164-S169
JAMA 2001;285:2736-2742
JAMA 2000;284:47-52
Osteoporos Int 1997;7:414-425



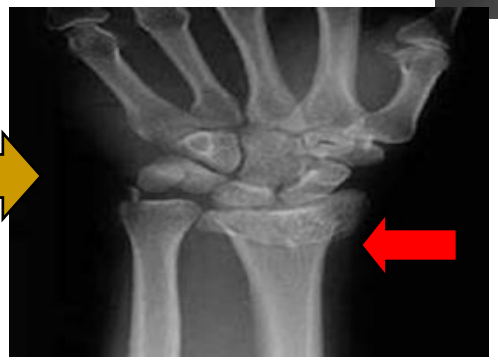
Common Fracture Sites

Spine

Hip

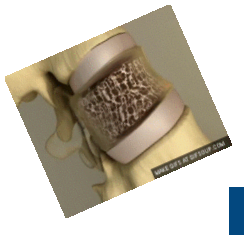


Wrist



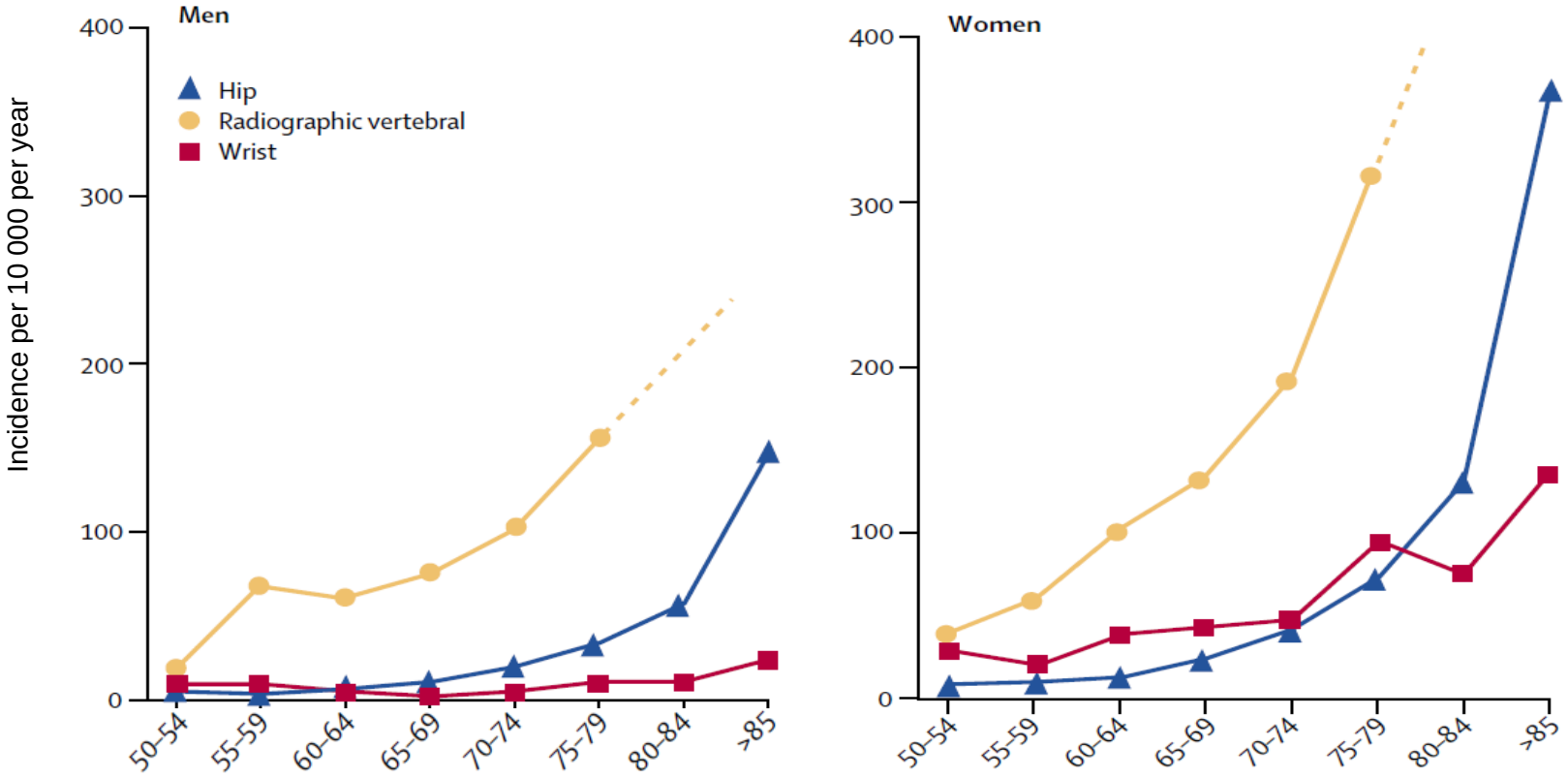
Uncommon sites

- Humerus, Ribs, Tibia, Pelvis

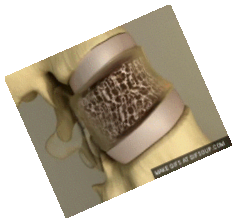


Incidence of osteoporotic fracture

Age-specific and sex-specific incidence of radiographic vertebral, hip, and distal forearm fractures



Sambrook P, et al. Lancet 2006; 367: 2010–18



Diagnosing of osteoporosis

Diagnosis

Procedures proposed in the investigation of osteoporosis

Routine

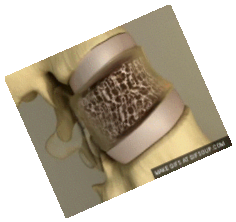
- History and physical examination
- Blood cell count, sedimentation rate or C-reactive protein. Serum calcium, albumin, creatinine, phosphate, alkaline phosphatase and liver transaminases
- Thyroid function tests
- Bone densitometry (DXA)

Other procedures, if indicated

- Lateral radiographs of lumbar and thoracic spine or DXA-based lateral vertebral imaging
- Serum protein immunoelectrophoresis and urinary Bence Jones proteins
- Serum 25-hydroxyvitamin D
- Plasma parathyroid hormone
- Serum testosterone, sex hormone binding globulin, follicle stimulating hormone, luteinizing hormone
- Serum prolactin
- 24 hour urinary free cortisol/overnight dexamethasone suppression test
- Endomysial and/or tissue transglutaminase antibodies
- Isotope bone scan
- Markers of bone turnover
- Urinary calcium excretion

Other investigations, for example, bone biopsy and genetic testing for osteogenesis imperfecta, are largely restricted to specialist centres.

Adopted from NOGG 2017: Clinical guideline for the prevention and treatment of osteoporosis P 09



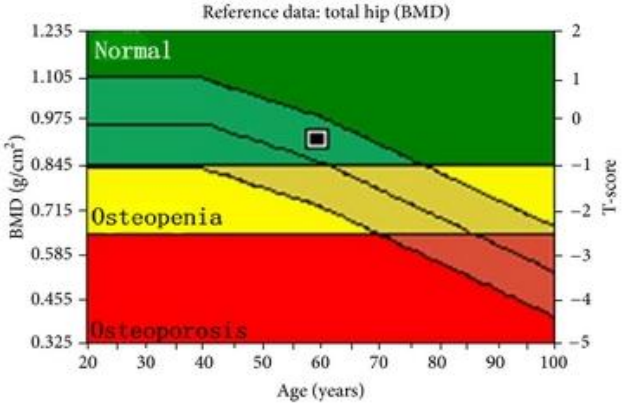
Diagnosis of osteoporosis

Diagnosis

Osteoporosis is defined by the WHO as a value for BMD 2.5 standard deviations or more below the healthy young adult mean (**T-score of -2.5**), where a T-score of zero is equal to the young adult mean[1,2]

BMD is typically measured using DXA[1–3]

- Low radiation X-rays detect small amounts of bone loss
- Measures spine and hip bone density, and also bone density of the whole skeleton

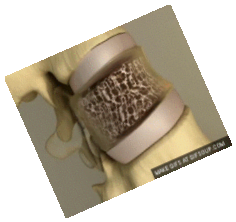


BMD and fracture risk should be assessed in:

- women aged over 65 years or 50–64 with certain risk factors[4]
- Men aged over 70 years or 50–69 with certain risk factors[5]
- patients receiving any dose of glucocorticoid for at least 3 months[6,7]

Fracture risk assessment is also performed using **FRAX®**, which calculates the 10-year probability of major fracture by integrating several risk factors[1,2,8]

[1]Hernlund E, et al. Arch Osteoporos 2013;8:136. [2]Kanis JA, et al. Osteoporos Int 2013;24(1):23–57. [3]Das S, et al. Drug Des Devel Ther 2013;7:435–448. [4]O'Connor KM. Med Clin North Am 2016;100(4):807–826. [5]Watts NB, et al. J Clin Endocrinol Metab 2012;97(6):1802–1822. [6]Briot K, et al.RMD Open 2015;1. [7]Grossman JM, et al. Arthritis Care Res (Hoboken) 2010;62(11):1515–1526. [8]Curtis EM, et al. Clin Med (Lond) 2015;15(Suppl 6):s92–s96. [9]Small RE. MedGenMed 2005;7(2):3. Image: https://www.hindawi.com/journals/ije/2013/895474/fig2/
Clinician's Guide to prevention & treatment of osteoporosis ,2014,Ver:01. National Osteoporosis Foundation(USA)



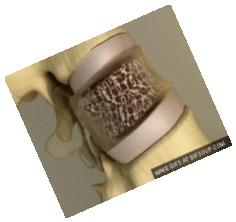
Contd…

Diagnosis

Dual energy x-ray absorptiometry

DEXA is the "gold standard"

- **Advantage:**
  - Non-invasive
  - Involves no special preparation
  - Radiation exposure is minimal (1-4 uSV)
  - The procedure is rapid, only takes about 20 minutes



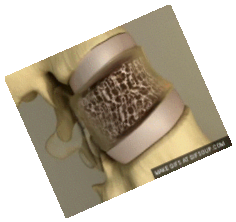
Contd….

Diagnosis

Screening- Ultrasound Densitometry

- **Advantage**
  - Can predict fracture risk in the elderly
  - Relatively inexpensive, portable
  - Uses no radiation
- **Disadvantage-**
  - can be used only in peripheral sites (eg. calcaneus, wrist), where bone is relatively superficial.

Harrison's Int Med, 18th edition, page 3125



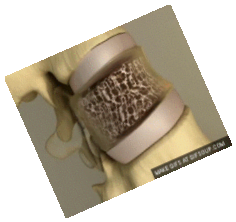
Contd….

Diagnosis

BMD Test Methods

- Quantitative computerized tomography (QCT)
- Quantitative ultrasound (QUS)
- Peripheral dual energy X-ray absorptiometry (pDEXA)
- Radiographic absorptiometry (RA)

Adopted from Clinician's Guide to prevention & treatment of osteoporosis ,2014,Ver:01. National Osteoporosis Foundation(USA)



Contd….

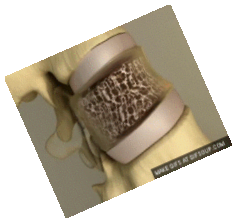
Diagnosis

Alveolar Gray Scale- Pixel Intensity of Mandible

- Pixel intensity in mandible may be another easy tool for assessing BMD.
- Changes in MABM were strongly correlated with the BMD.
- This combined relationship can be used as an easy diagnosis tool for OP.

Majumder et al.Dentomaxillofacial Radiology 2010;39:409-413

Majumder MI et al. International Journal of dental and Medical speciality Vol2.issue2.Apr-jun 2015

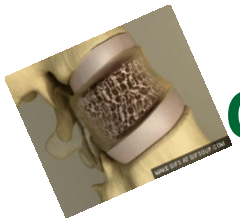


Contd….

FRAX

- Developed in 2008 by WHO.
- Applicable aged 40-90 years.
- Outputs are 10 year probability of hip fracture and a major fracture- vertebral.
- Can be used with or without BMD results.
- To decide treatment in osteoporosis.

www.ncbi.nlm.gov/book/NBK115321
Cliv Clin J Med 2009;76(8):457



Contd….

Diagnosis

FRAX Tool: On-line Calculator

Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: Canada Name/ID: About the risk factors

Questionnaire:

1. Age (between 40-90 years) or Date of birth
   Age: 59 Date of birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg) 55.5
4. Height (cm) 154
5. Previous fracture — No / Yes
6. Parent fractured hip — No / Yes
7. Current smoking — No / Yes
8. Glucocorticoids — No / Yes
9. Rheumatoid arthritis — No / Yes
10. Secondary osteoporosis — No / Yes
11. Alcohol 3 or more units per day — No / Yes
12. Femoral neck BMD (g/cm²)
    T-Score -2.0

Clear Calculate

BMI 23.4

The ten year probability of fracture (%)

with BMD

Major osteoporotic	7.5
Hip fracture	1.0

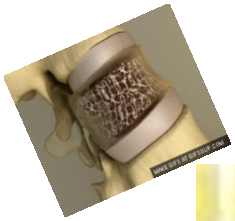
Weight Conversion

Pounds → Kgs Convert

Height Conversion

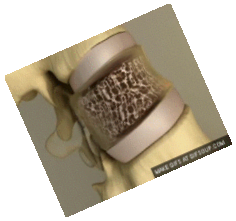
Inches → Cms Convert

www.shef.ac.uk/FRAX.



Diagnosis

The FRAX calculator in 63 countries and in 34 languages including Bengali
FRAX online risk assessments reach 20 million milestone.



Diagnosis

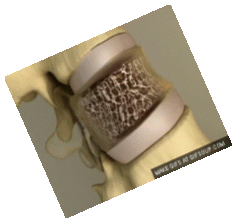
TBS

Bone density + microarchitecture- L1-L4

-1350 or above- Normal.

- 1350-1200- Osteopenia

- Less than 1250 - OP



Treatment

Best approach

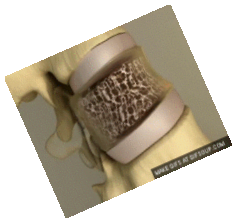
Intervention strategies based on fracture probabilities are highly effective, and more reliable than the use of BMD alone both in terms of identifying high-risk individuals for treatment and in avoiding intervention in those at low risk.

BMD & FRAX combination is better

+ TBS- bone density + microarchitecture

1350-1200- <. ? Best.

Johansson H ENT al. Osteoporos Int (2017). DOI 10.1007/s00198-017-4160-7

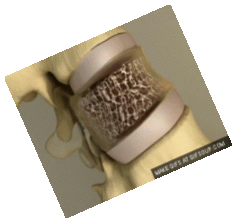


Biochemical markers of bone turnover

Biochemical markers of bone remodeling [e.g. resorption markers-serum C-telopeptide (CTX), urinary N-telopeptide (NTX) and formation markers serum *bone specific alkaline phosphatase (BSAP),* osteocalcin (OC) and amino-terminal propeptide of type I procollagen (PINP). Specimens should be collected in the morning while patient is fasting.

Biochemical markers of bone turnover determination for research, not clinical implications.

Adopted from Clinician's Guide to prevention & treatment of osteoporosis ,2014,Ver:01. National Osteoporosis Foundation(USA)

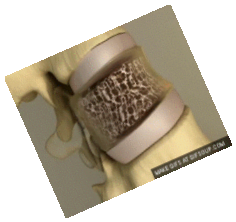


Treatment:

Treatment

Goals of treatment

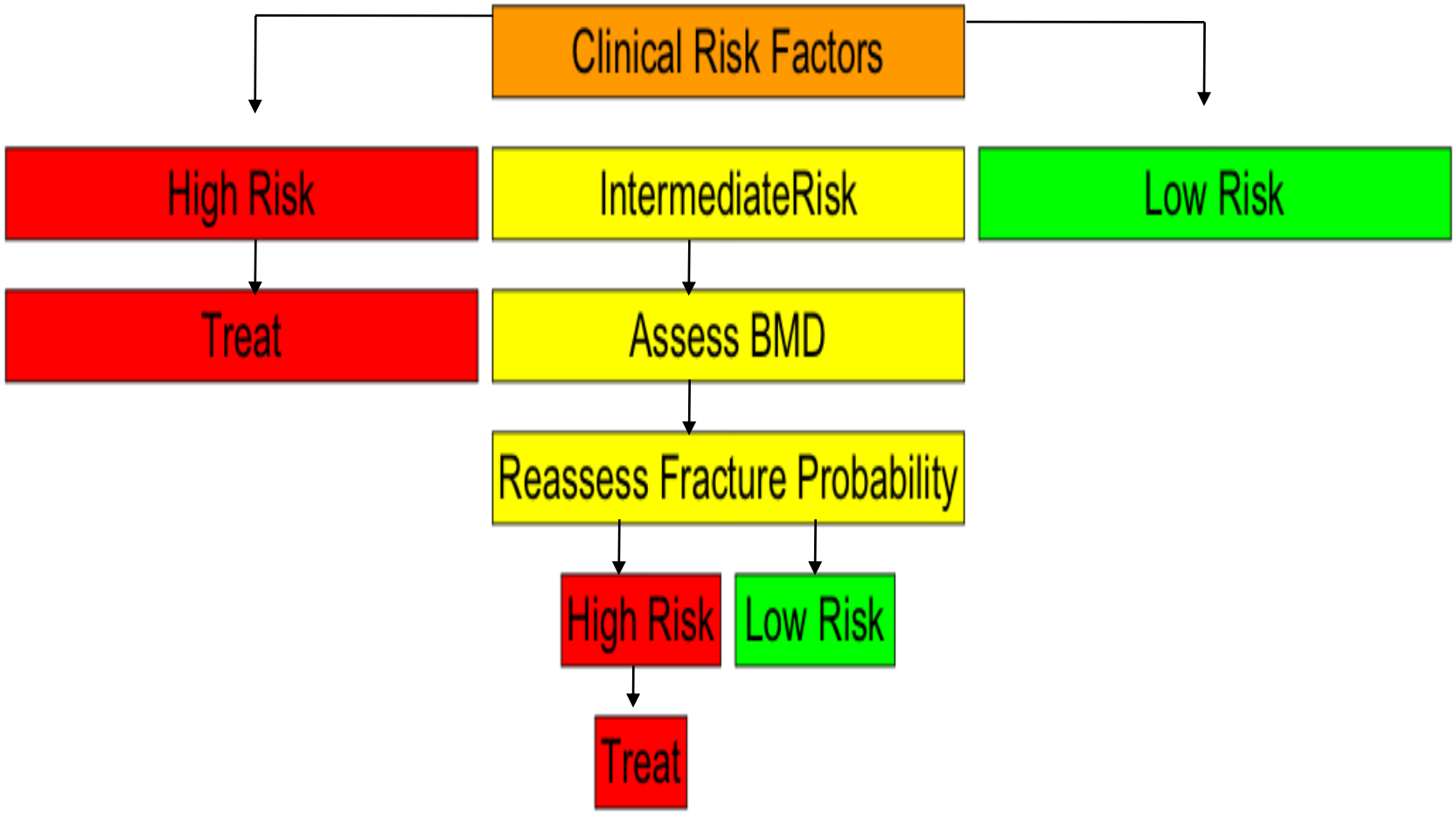
- Prevent further bone loss.
- Increase or at least stabilize bone density.
- Prevent further fractures.
- Relieve deformity (e.g., kyphoplasty)
- Relieve pain.
- Increase level of physical functioning.
- Increase quality of life.



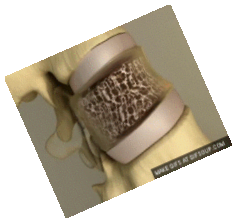
Management

Treatment

WHO Algorithm



Adapted from Kanis, WHO Technical Report, 2008



Treatment

Treatment Algorithm for Osteoporosis

AACE/ACE 2016 Postmenopausal Osteoporosis Treatment Algorithm

Lumbar spine or femoral neck or total hip T-score of ≤ -2.5, a history of fragility fracture, or high FRAX® fracture probability*

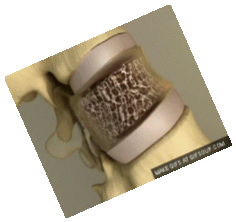
Evaluate for causes of secondary osteoporosis

Correct calcium/vitamin D deficiency and address causes of secondary osteoporosis

- Recommend pharmacologic therapy
- Education on lifestyle measures, fall prevention, benefits and risks of medications

No prior fragility fractures or moderate fracture risk**

Prior fragility fractures or indicators of higher fracture risk**



Treatment Algorithm for Osteoporosis (Contd...)

Treatment

AACE/ACE 2016 Postmenopausal Osteoporosis Treatment Algorithm

- Alendronate, denosumab, risedronate, zoledronic acid***
- Alternate therapy: Ibandronate, raloxifene

Reassess at least yearly for response to therapy and fracture risk

Increasing or stable BMD and no fractures	Progression of bone loss or recurrent fractures
Consider a drug holiday after 5 years of oral and 3 years of IV bisphosphonate therapy	• Assess compliance • Re-evaluate for causes of secondary osteoporosis and factors leading to suboptimal response to therapy
Resume therapy when a fracture occurs, BMD declines beyond LSC, BTM's rise to pretreatment values or patient meets initial treatment criteria	• Switch to injectable antiresorptive if on oral agent • Switch to teriparatide if on injectable antiresorptive or at very high risk of fracture

- Denosumab, teriparatide, zoledronic acid***
- Alternate therapy: Alendronate, risedronate

Reassess at least yearly for response to therapy and fracture risk

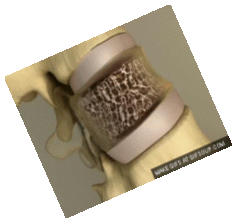
Denosumab	Teriparatide for up to 2 years	Zoledronic acid
Continue therapy or consider adding teriparatide if progression of bone loss or recurrent fractures	Sequential therapy with oral or injectable antiresorptive agent	• If stable, continue therapy for 6 years**** • If progression of bone loss or recurrent fractures, consider switching to teriparatide

* 10 year major osteoporotic fracture risk ≥ 20% or hip fracture risk ≥ 3%. Non-US countries/regions may have different thresholds.

** Indicators of higher fracture risk in patients with low bone density would include advanced age, frailty, glucocorticoids, very low T scores, or increased fall risk.

*** Medications are listed alphabetically.

**** Consider a drug holiday after 6 years of IV zoledronic acid. During the holiday, another agent such as teriparatide or raloxifene could be used.



Management of Osteoporosis

Treatment

Treatment / Secondary Prevention

Lifestyle

- Diet
- Exercise
- Smoking
- Alcohol Intake
- Sunlight Exposure

Pharmacological

- Drugs altering BMD
- Analgesia

Non-pharmacological

- Physiotherapy
- Pain Relief

Falls Assessment

Prevention / Primary Prevention

Lifestyle

- Diet
- Exercise
- Smoking
- Alcohol Intake
- Sunlight Exposure

Pharmacological

- Drugs altering BMD

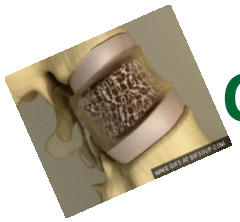
Non-pharmacological

- Physiotherapy
- Hip Protectors

Prevention of Falls

Wong Pk et al:Clin Sci(Lond)2007.113;233:241-246

Adopted from Clinician's Guide to prevention & treatment of osteoporosis ,2014,Ver:01. National Osteoporosis Foundation(USA)



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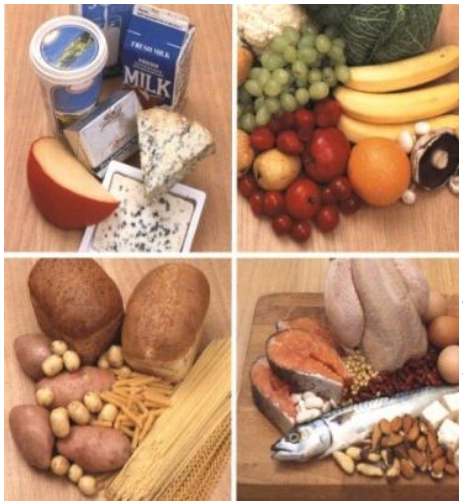
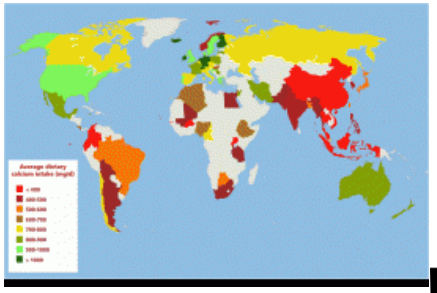
Lifestyle Advice



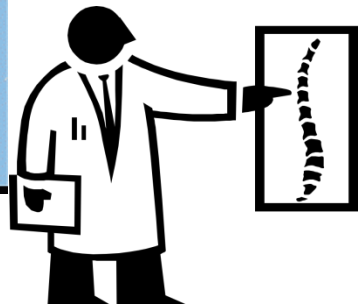
Diet

Balanced diet. Calcium 1200 mg/day 800 to 1000 (IU) of vitamin D/day Amino acids Alanine, arginine.



Exercise

Regular weight bearing exercise, muscle strengthening exercise 3 times a week for 20 minutes minimum



Smoking

Stop smoking

Alcohol

Within safe limits

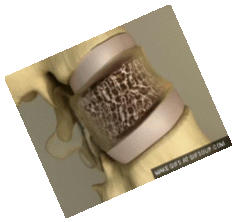
2u/day women

3u/day men

Sunlight Exposure

15-20 minutes on face, hands and forearms twice weekly form April to October

Nutr Rev 2008;66(suppl 2):5182-5194
Endocr Pract 2009;15:95-103
Cangussu LM et al. Osteoporos Int 2015;26:2413-21
Wang J et al. J Bone Miner Res 2015;30:1641-50
Ann N Y Acad Sci 2006;1068:429-446
Clinician's Guide to prevention & treatment of osteoporosis ,2014,Ver:01. National Osteoporosis Foundation(USA Dr.Axe, Food is Medicine



Treatment of Osteoporosis…

Treatment

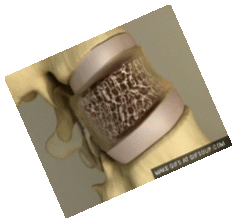
Role of Yogurt

A study published on May,2017 led by Trinity College, Dublin, which was the largest observational study to date of dairy intakes and bone and frailty measurements in older adults has found that increased yogurt consumption was associated with a higher hip bone density and a significantly reduced risk of osteoporosis in older women and men on the island of Ireland.

- Total hip and femoral neck bone mineral density measures in females were 3.1-3.9% higher among those with the highest yogurt intakes compared to the lowest.
- In men, the biomarker of bone breakdown was 9.5%lower in those with the highest yogurt intakes compared to the lowest.

- a 31% lower risk of osteopenia and a 39% lower risk of OP in women.
- a 52% lower risk of OP in men.

http://www.tcd.ie/news_events/articles/yogurt-consumption-in-older-irish-adults-linked-with-better-bone-health/7811



Regular Weight-Bearing and Muscle - Strengthening Exercise

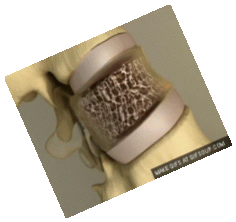
Treatment

- Muscle-strengthening exercise includes weight training and other resistive exercises, such as yoga, Pilates and boot camp programs.

- Weight-bearing exercise (in which bones and muscles work against gravity as the feet and legs bear the body's weight) includes ;
  - Walking
  - Jogging
  - Tai-chi
  - Stair climbing
  - Dancing
  - Tennis etc.

Weight-bearing exercise

Clinician's Guide to prevention & treatment of osteoporosis ,2014,Ver:01. National Osteoporosis Foundation(USA)

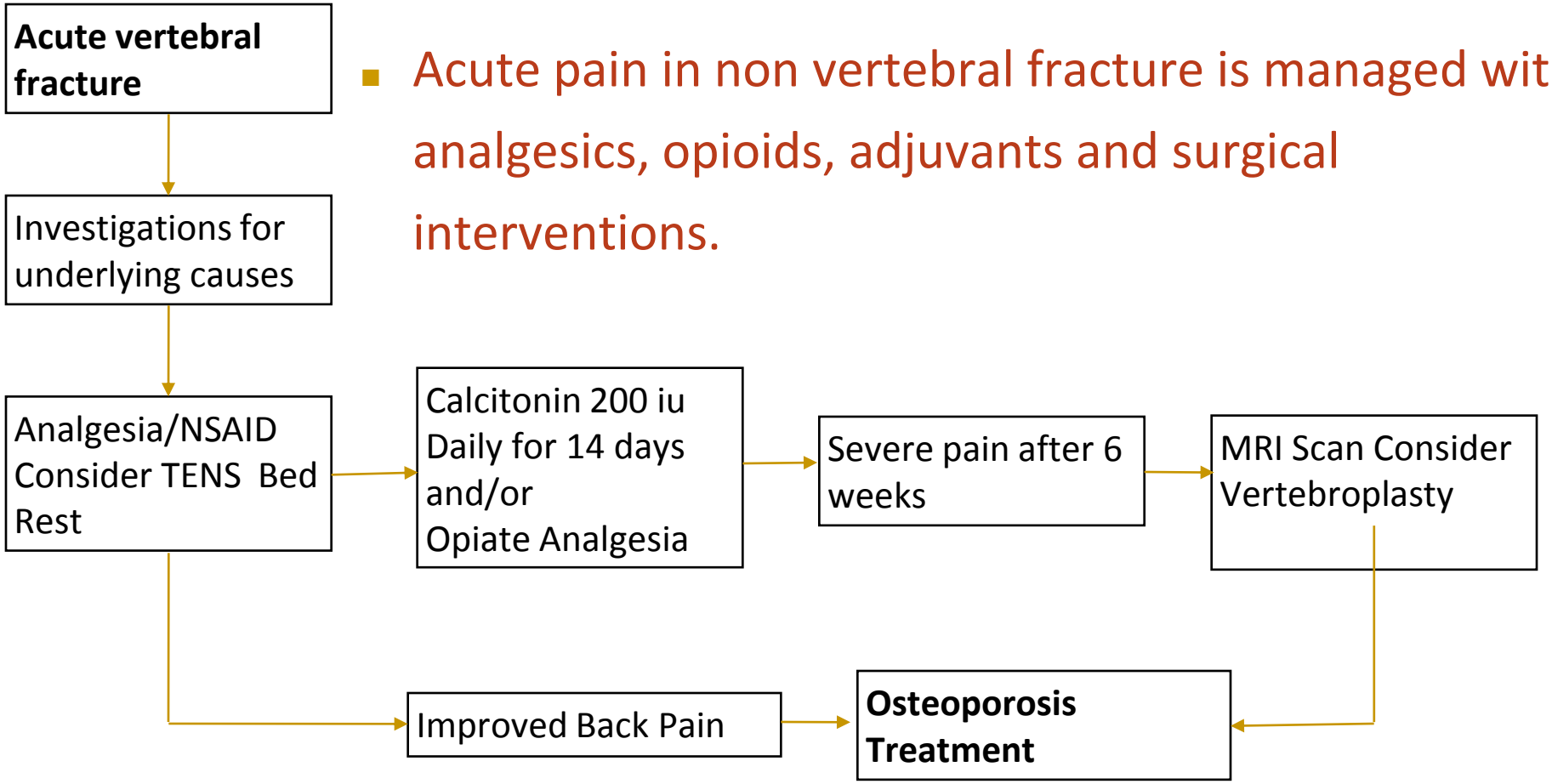


Contd….

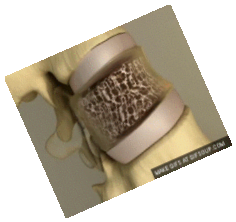
Treatment

Treatment of acute vertebral fracture pain

- Acute pain in non vertebral fracture is managed with analgesics, opioids, adjuvants and surgical interventions.



Clinical cases in Mineral and Bone Metabolism 2014;11(11):173-176



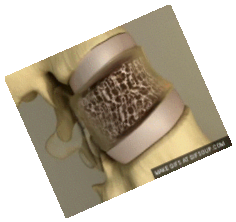
Medications Approved by the U.S. Food and Drug Administration for Osteoporosis

Treatment

Indication	*Medication*	*Typical dosage*	*Route*	*Fracture type*
Prevention	Estrogen†, with or without progesterone	0.625 mg daily	Oral	Hip, vertebral, nonvertebral
Prevention and treatment	Alendronate (Fosamax)	70 mg weekly	Oral	Hip, vertebral, nonvertebral
	Ibandronate (Boniva)	150 mg monthly	Oral	Vertebral
	Risedronate (Actonel)	35 mg weekly	Oral	Hip, vertebral, nonvertebral
	Raloxifene (Evista)	60 mg daily	Oral	Vertebral
Treatment	Ibandronate	3 mg every three months for four doses	Intravenous	Increases bone mineral density, b fracture end poin not evaluated
	Zoledronic acid (Reclast)	5 mg annually for three doses	Intravenous	Hip, vertebral, nonvertebral
	Calcitonin (Miacalcin)	200 IU daily	Nasal	Vertebral
	Teriparatide (Forteo)	20 mcg daily up to two years	Subcutaneous	Vertebral, nonvertebral

All therapeutic management strategies for the prevention and treatment of osteoporosis include recommendations for **calcium and vitamin D supplementation**[1]

Sözen et al. Osteoporosis Eur J Rheumatol 2017; 4: 46-56



Treatment

Bisphosphonates -

- **Alendronate**
- **Ibandronate**
- **Risedronate**
- **Zoledronic acid**

Anti-resorptive therapies such as bisphosphonates:

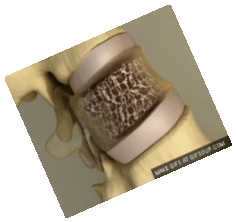
- reduce bone turnover
- inhibit further microarchitecture deterioration
- increase bone mass and quality
- strengthen bone
- reduce fracture risk

NOGG 2017: Clinical guideline for the prevention and treatment of osteoporosis P 12

[2]Hernlund E, et al. Arch Osteoporos 2013;

[3]Raisz, LG. J Clin Invest 2005;

[4]Brown JP, et al. Can Fam Physician 2014;



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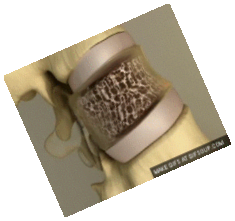
Treatment

Bisphosphonate should be used for at least 3 years, now extended treatment should be given.

	Treatment	Extended treatment
Alendronate study	0-4 years	5-10 years
Risedronate study	0-3 years	6-7 years
Zoledronic acid	0-3 years	4-6 years

- Not at high fracture risk after 3-5 yrs of BP treatment, a drug holiday of 2-3 yrs can be considered.

N Engl J Med Aug 2012;22:366
Adler RA at el. J Bone Miner Res 2015; doi:10.1002/jbmr.2708.

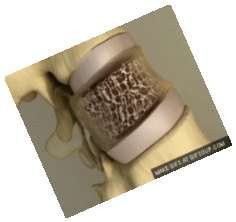


Contd….

Treatment

- Although IV BPs are generally safe, transient influenza-like symptoms.
- ONJ- 1-19 per 100,000 (IV: oral = 3:1).
- Cardiac arrhythmia- AF.
- Denosumab had lower ONJ.
- Atypical fracture of femur with BP for as long as 10 years – large studies – FIT, FLEX, HORIZON did not support

Patricia |Sieber et al.Clinical Drug Investigation (2013) 33:117 122. DOI 10.1007/s40261 012 0041 1
Zhang X et al. J Bone Miner Res 2015; doi:10.1002/jbmr.2693
Khan A et al.Osteoporos Int.DOI 10.1007/s00198-015-3335-3
N Engl J Med 2010:1761-71



Treatment

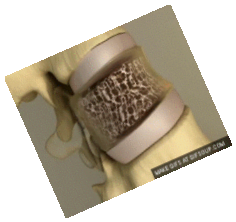
Mutation & bisphosphonates..

- A team of researchers of the University of Barcelona and the Hospital del Mar Medical Research Institute (IMIM) have discovered a new mutation is vulnerable to the bisphosphonate.
- Instead of strengthening the bone and prevent it from getting fractures, it worsens.

Some Controversies

Adopted from NOGG 2017: Clinical guideline for the prevention and treatment of osteoporosis P 12
http://www.news-medical.net/news/20170504/New-mutation-predisposes-patients-under-osteoporosis-treatment-to-atypical-femur-fractures-study-finds.aspx

N Engl J Med 370;5 Nejm.Org January 30, 2014



Treatment

Other pharmacological options …

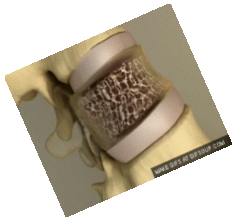
- **Denosumab** is a fully humanised monoclonal antibody against Receptor Activator of Nuclear factor Kappa B Ligand (RANKL),
- **Raloxifene** is a selective oestrogen receptor modulator and inhibits bone resorption.
- **Teriparatide -** good anabolic activity and antiosteoporotic activity.

Abaloparatide is the first new anabolic treatment approved for postmenopausal OP

- in general reductions of 30-70% have been reported for vertebral fracture, up to 20% for non-vertebral fracture and up to 40% for hip fracture.

Adopted from NOGG 2017: Clinical guideline for the prevention and treatment of osteoporosis P 14-15
Medscape,12 Nov,2017.

Adopted from NOGG 2017: Clinical guideline for the prevention and treatment of osteoporosis P 14-15

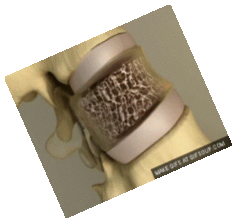


Role of anabolic steroid:

Anabolic steroids exerts positive effects on vertebral BMD and on bone pain in postmenopausal OP.

Fracture reduction - needs prospective trials.

Clin Calcium. 2008 Oct;18(10):1451-9. doi: CliCa081014511459
International Journal of Orthopaedics 2014; 1(4): 164-167



Treatment

New pharmacological option…

Icariin:

- Prenylated flavonol glycoside isolated from Epimedium herb-represent a class of flavonoids.
- Bone-promoting activity, which could be used as potential treatment of postmenopausal OP.

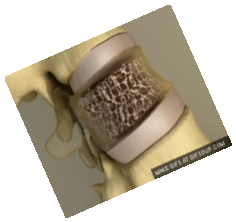
Z Wang D et al. Osteoporosis International 2017

Treatment

Novel & Future Therapies- new armaments

- Wnt protein modulating drugs
- Monoclonal antibody Sclerostin antagonist – Romosozumab.
- PTH & PTHrp analogues, possibly calcilytics- JTT305/MK-5442
- Inhibitors of bone resorption as Cathepsin K inhibitors- Odanacatib
- Sequential therapies with 2 or more bone active substances.
- Icariin!!!

Swiss Med Wkly 2012;142:124-36



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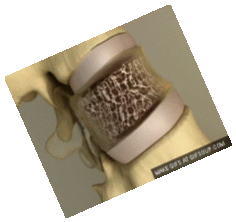
Treatment

Causes of Failure to Respond to OP Therapy

- Drug compliance
- Nutritional deficiency of Ca.
- Vitamin D deficiency
- Co-morbid condition
- Medications- secondary bone loss
- Lack of efficacy to existing therapy

Clin Instrum in Aging 2008;3(2):315-329



Monitoring:

Treatment

Conventional

- Postmenopausal osteoporosis/ primary

  BMD – 0, 2 years

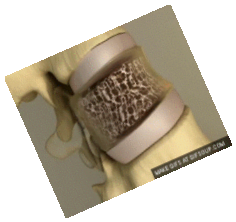
- Steroid induced osteoporosis

  BMD – 0,1,2 years

New

For 5 years of treatment with BP or Denosumab monitoring of BMD is not necessary, according to new clinical guidelines from ACP.

Medscape,12 Nov,2017.



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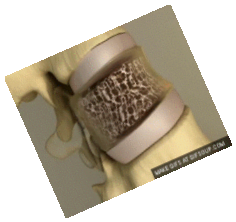
Treatment

LSC:

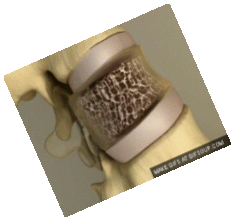
- Least significant change calculated in BMD with gm/cm^2 , not in T or Z score
- Expected 6% or more
- Stable or <4% decrease



Treatment

Challenges & controversies

- Impact of osteoporosis is high.
- Underlying pathology – still in innovation.
- Racial variation of peak bone mass not known.
- DEXA measurement is not available everywhere.
- Expensive drugs.
- No pharmacologic agent can effectively increase both non-spine and spine BMD.
- OP vs Osteomalacia.



Take home messages -

- OP is under recognized & under treated, in postmenopausal and Geriatric populations.
- Diagnostic Tools would be (BMD & FRAX)
- Non Pharmacologic therapy- Vit. D & Ca. supplementations
- Pain management.
- Currently approved drugs are HRT, SERM, Calcitonin, PTH, Bisphosphonate, Denosumab, Romosozumab.
- BP is foundation therapy despite all controversies Zoledronic acid is best.
- Newer drugs - Cathepcin K inhibitor-Odanacetib, oral PTH, oral Calcitonin, Icariin.
- Sequential therapy is new theme to combat OP.


Thank you !