



Osteoporosis

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⇒ common in female (40 سنة) ^{عمر}

Osteoporosis :-

- Term used "or diseases or diverse etiology that cause a reduction in the mass of bone per unit volume • ↓ mass "

- Osteomalacia – in which mineralization of the organic matrix is defective ^{↓ vitamin D + salts .}

Osteopenia if not treated leads to Osteoporosis.

Pathological fracture → fracture on top of abnormal bone

stress : repeated micro trauma leads to fracture . " لينود "

Silent : Fracture في عنق الورك

في عنق الورك neck of femur

10% تنكس

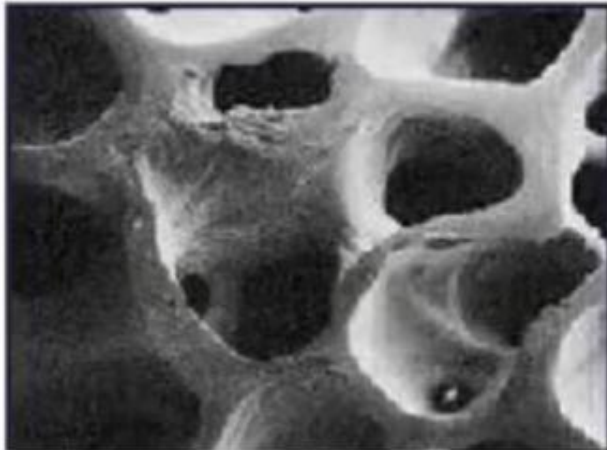
التآكل

صالح برنا في
management of
osteoporosis.

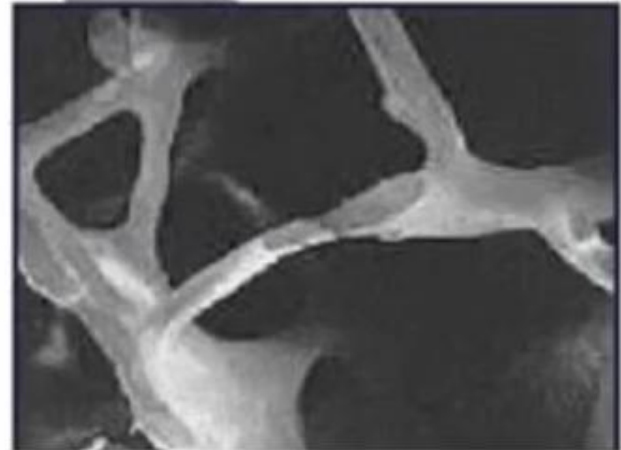
Section of bone
showing osteoporosis



Normal Bone



Osteoporotic Bone





A disease characterized by: – low bone mass and, – structural deterioration of bone tissue

- leads to bone fragility & susceptibility to fractures (commonly: spine, hip & wrist)
- Silent until a fracture occurs

Epidemiology

- Incidence
 - 10 million Americans and 200 million people worldwide have osteoporosis
 - 34 million Americans have osteopenia
 - 1.5 million osteoporotic fractures occur each year.
 - male: female ratio is 1:4 men have a higher prevalence of secondary osteoporosis (60%) including

في الضعاف العظمى
عشاء قوي موزون Fat ر فينايب د

Vitamin D presents in sub fat layer → في الحشوات
نتيجة لـ
bone
ويحل

Osteolysis
بسر يكسر العظم
عند تفاعل
 Ca^{2+} + Vitamin D

Pathophysiology

- Osteoporosis is characterized by loss in both cortical thickness and in number and size of the trabeculae of cancellous bone.
- In 1993, the condition was defined by the Consensus Development Conference on Osteoporosis as a “systemic skeletal disease characterized by low bone mass and micro-architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture.”

عصبی علی
مفتوی
①
Cortix
②
cancellous

- 
- Significant morbidity and mortality is associated with this condition. The general clinical features of osteoporosis include fractures of vertebrae (lower thoracic and upper lumbar), wrist, hip, humerus and tibia, which can occur suddenly with trivial movements, as well as poor posture due to spinal deformities leading to mechanical pain.

Classification of Osteoporosis

	Type I (<i>Post menopausal</i>)	Type II (<i>Senile</i>)
Age group	Post menopausal (highest incidence in <u>50-70 years old</u>)	<u>>70 years old</u> <i>male</i>
Bone affected	Almost exclusively <u>trabecular</u>	Trabecular ⁽⁺⁾ <u>> cortical</u>
Bones fractured	Distal radius and vertebral	Hip and pelvis
Effect on calcium	Net negative change in calcium levels because of decreased intestinal absorption and increased urinary excretion of calcium.	Poor <u>calcium absorption</u>
Effect on Vit D	Reduced circulating levels of total (but not free) 1,25 dihydroxyvitamin D	<i>Normal v.D</i>

→ demineralization.

مقدار الكالسيوم ينخفض
فيتامين D
يكون ناقص

Osteoporosis can be classified into

- 1) groups of conditions without known etiology,
- 2) specific disorders which result in osteoporosis with a well understood pathogenesis,
- 3) specific disorders which result in osteoporosis but the pathogenesis is not understood

Risk factors



↑ age, women, slim patient, taking drugs
+ smokers, alcoholic
↓ steroids
lactation

Causes and risk factors

- **Age:** Typically, the older you get, the more at risk you are.
- **Gender:** Women, especially women in menopause, are more likely to get osteoporosis than men, as low estrogen levels lead to weak bones.
- **Genetics:** Osteoporosis can be inherited.
- **Body type:** People with a small, slender build are more likely to develop it.
- **Medications:** Medications such as steroids have been linked to osteoporosis, according to the Mayo Clinic.

must
replace
Ca
vit
D
← hypothyroidism

- Thyroid problems: Some have been linked to osteoporosis.
- Low vitamin D and calcium levels: Low levels can lead to bone loss.
- Lack of exercise or long-term bed rest: Both situations can weaken bones.
- Tobacco and alcohol: They can weaken bones as well.

Lifestyle	Medications
• Sedentary <u>lifestyle</u> • Caucasian woman of northern European descent → Smokers • Low body weight • Low protein intake • Heavy <u>drinkers</u> • Positive <u>family history</u> • Premature <u>menopause</u> → Breast feeders with <u>low vitamin D diets</u> المرصعات (صفوة بعدة مؤثر)	→ Phenytoin (<u>Dilantin</u>) therapy • reduces vitamin D metabolism → Cytotoxic/antineoplastic drugs → Selective serotonin <u>reuptake inhibitors</u> (SSRIs) • e.g. fluoxetine, sertraline, paroxetine • Antiretroviral therapy • Cyclosporine → <u>Furosemide</u> • High dose methotrexate • Oversupplementation with Levothyroxine • Omeprazole → Glucocorticoids • Unfractionated heparin and LMWH • Vitamin A • Thiazolidinediones • rosiglitazone (Avandia)
Genetic Polymorphisms	Diseases
• Calcitonin receptor • Estrogen receptor-1 • <u>Type I collagen alpha-1 chain (COL1A1)</u> • osteogenesis imperfecta in adults • Vitamin D receptor • <u>LRP5 (low-density lipoprotein receptor-related protein)</u>	• Malabsorption syndromes • Liver disease • <u>Hyperthyroidism</u> • Type I diabetes mellitus • Cancer • Chronic renal failure • COPD • Rheumatoid arthritis • Sarcoidosis

Clinical examination

- ❖ age bracket

- ❖ osteoporosis

- ❖ postmenopausal osteoporosis is highest in women aged 50-70 years

- ❖ senile osteoporosis begins after 70 years

- ❖ secondary osteoporosis begins at any age

- ❖ fractures

→ wrist
→ vertebral fractures
→ hip

dexa scan.

- ❖ wrist fractures occur most commonly at age 50-60 years

- ❖ vertebral fractures occur most commonly at age 60-70 years

- ❖ hip fractures occur most commonly at age 70-80 years

Associated conditions

- fragility fractures = minimal trauma.
- direct relationship between degree of bone loss and fractures
- kyphotic deformity can arise from vertebral body fractures
- pelvic ring insufficiency fractures most often treated with bed rest and analgesia
- total hip arthroplasty with constrained components are a risk factor for fragility fractures

انحراف
- 2.5
no
standard.
deviation

diagnosed

- This exam is used to measure bone mineral density (BMD). It is most commonly performed using dual-energy x-ray absorptiometry (DXA or DEXA) or bone densitometry. The amount of x-rays absorbed by tissues and bone is measured by the DXA machine and correlates with bone mineral density.

age group
تقاریر د
اقل عمر

تقاریر نفسی
age group

The DXA machine converts bone density information to your T score and Z score. The T score measures the amount of bone you have in comparison to a normal population of younger people and is used to estimate your risk of developing a fracture and need for drug therapy. Your Z score measures the amount of bone you have in comparison to those in your age group. This number can help indicate whether there is a need for further medical tests.

- BMD

absolute, patient-specific score determined from certain anatomic areas

- T score BMD
relative to normal young matched controls (30-year-old women)

- Z score
BMD relative to similar aged patients.

- Osteopenia
L2-4 lumbar density of 1 to 2.5 standard of deviations
(T score -1 to -2.5) below the peak bone mass of a 25
year old individual

- Osteoporosis
L2-4 lumbar density > 2.5 standard of deviations (T
score < -2.5) below the peak bone mass of a 25 year old
individual

Signs of osteoporosis :-

- ① thinning of thickness of cortex
- ② ^{is} prominent chin
painful
- ③ varum
or
valgum
or
pain in the knee
- ④ pain in vertebrae or generalized pain.

• لا ال Chin بارزة مدوّلة
 • لا ال knee خفيف
 • Valgus varum ←
 Pain ⇒ osteoporosis.

- *Bone x-ray*: Bone x-ray produces images of bones within the body, including the hand, wrist, arm, elbow, shoulder, foot, ankle, leg (shin), knee, thigh, hip, pelvis or spine. It aids in the diagnosis of fractured bones, which are sometimes a result of osteoporosis.

• Thinning of cortical bone ←
 عقازنة بال age group
 تبديل

← Thickness الـ سُمك
of ant, post cortex
← lower, upper end plate

← سُمك
+ thinning

↑ spinal
pain لا يَسَبِّحُ هوَ

- CT scan of the spine : CT scanning of the spine is performed to assess for alignment and fractures. It can be used to measure bone density and determine whether vertebral fractures are likely to occur.

منحرفه کا سٹوفا
قوسیدہ
Kyphotic ↑

- MRI of the spine : Magnetic resonance imaging of the spine is performed to evaluate vertebral fractures for evidence of underlying disease, such as cancer, and to assess if the fracture is old or new. New fractures usually demonstrate a better response to treatment by vertebroplasty and kyphoplasty.

Treatment and prevention

- **Nonoperative**

- ① → • lifestyle modification & vitamins indications

- ② • calcium and Vitamin D

- pharmacologic treatment indications

2008 National Osteoporosis Foundation Guidelines for Pharmacologic Treatment of Osteoporosis suggests that pharmacologic treatment be considered for

- ⑤ → • *give hormonal therapy in* postmenopausal women and men ≥ 50 yrs old with:
 - hip/vertebral fracture
 - T score between -1.0 and -2.5 at the femoral neck/spine and
 - 10-year risk of hip fracture $\geq 3\%$ or

- T score -2.5 or less at the femoral neck/spine.

pharmacologic agents

- calcium and Vitamin D

→ 150mg ← bisphosphonates (osteoclast inhibitory ⊕ osteoblast activation)
once monthly

- Conjugated Estrogen-progestin hormone replacement (HRT)

→ 70mg
once weekly

- Estrogen-only replacement (ERT)

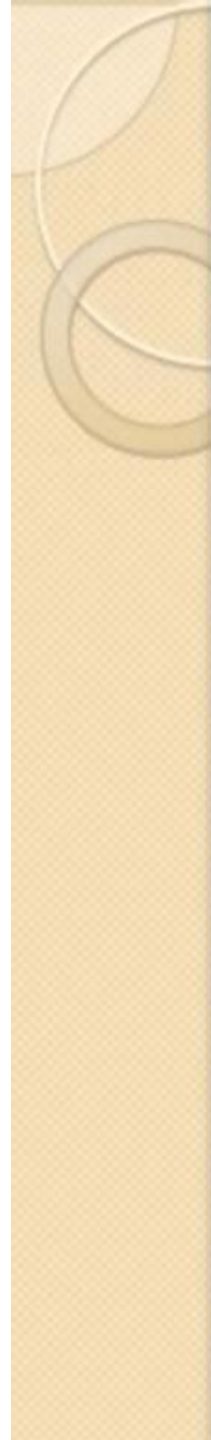
→ 10mg
once daily

- Salmon calcitonin (Fortical or Miacalcin)

- Raloxifene (Evista)

- Teriparatide (Forte)

خطر عملي
Carcinogenic

- 
- Medications can also help with osteoporosis. Antiresorptive medications slow the rate of bone loss. Anabolic medications promote bone growth.
 - For women in menopause, estrogen therapy can help prevent bone loss and strengthen bones. For women in post-menopause, bisphosphonates are the preferred treatment for osteoporosis.

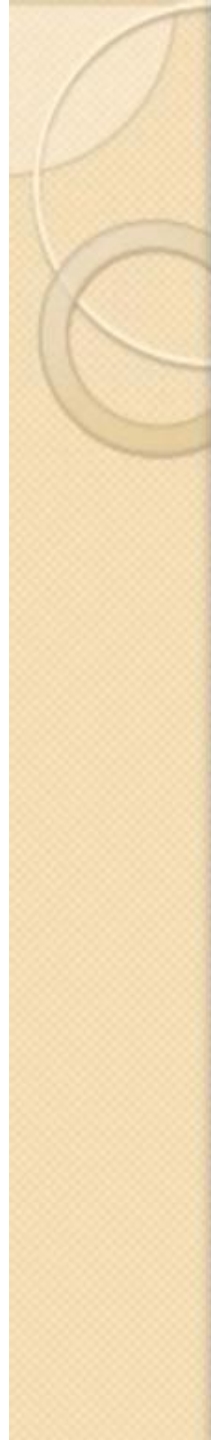
Operative : kyphoplasty : needle → ^{جس} under CT guide on vertebral body
called bone cement ^{جس} و expansion under ^{جس} air

- ❖ osteoporotic vertebral compression fracture.
- ❖ femoral neck fracture. ⇒ close reduction → open ^{then} fixation.
- ❖ distal radius fracture

Prognosis

- prior fragility fracture is the strongest predictor of a future fracture from low energy trauma
- vertebral fractures
- associated with 15% increase in 5-year mortality
- associated with increased morbidity
- back pain
- loss of height · *انخفاض*
- poor balance
- respiratory compromise
- restrictive lung disease
- pneumonia

*مُتَدَرِّجَةً
in kyphotic
deformities*

- 
- hip fractures
 - associated with 20% increase in mortality
 - men have higher mortality rates following hip fractures than women
 - associated with increased morbidity
 - reduced quality of life
 - only one third of patients with hip fractures return to their previous level of function

