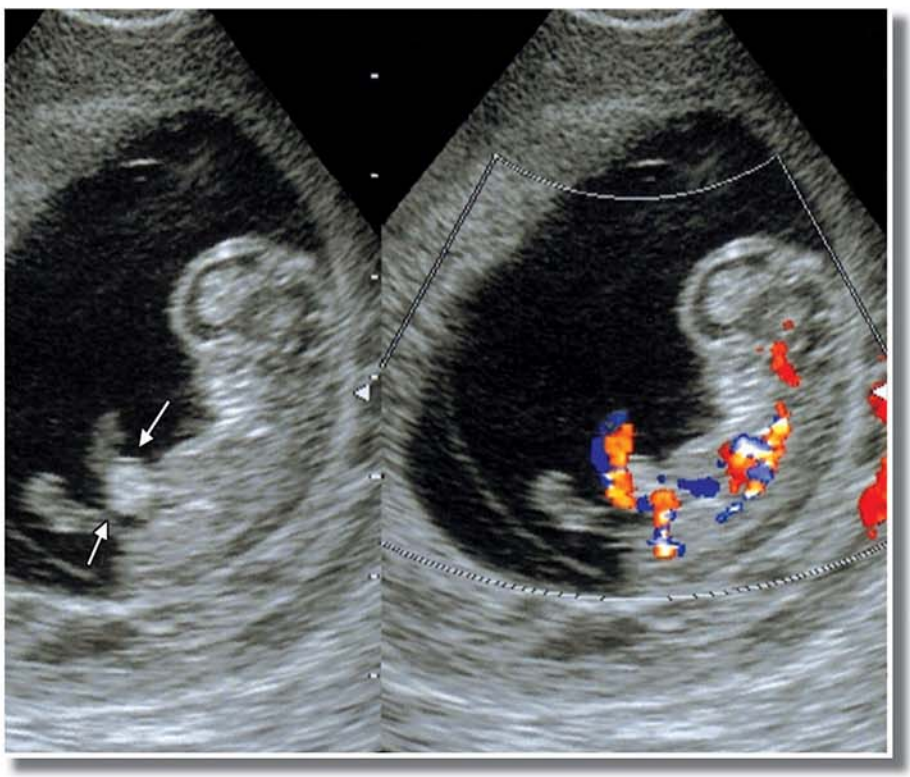
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Step by Step®

Case Studies in Obstetrics & Gynecology

Sanja Kupesic Plavsic



JAYPEE

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Case Study 4

Sanja Kupesic Plavsic, Jason R Ross, Jami J Barnard, Thomas G Tullius Jr, Benjamin D Ramos, Lisa Montgomery

Patient Introduction

- Ms Irma Arras, a 66-year-old (G0P0) woman, presents for her annual check-up exam
- She has never taken hormonal replacement therapy (HRT). She has rheumatoid arthritis for which she was taking steroids.

History of Present Illness

Ten years ago she broke her right forearm.

Questions/Patient Introduction

1. As a postmenopausal woman, what side effect of steroids would you be most concerned about in this patient?

a. Uncontrolled bleeding
b. Bone loss
c. Purple striae
d. Diabetes mellitus
e. Cataracts.

Ans. b

Explanation: A postmenopausal women is already at risk for osteopenia due to the decrease in estrogen production. Glucocorticoids have adverse effects on many different organ systems. While some of the answer choices are possible with chronic steroid use, this patient taking steroids is especially at risk because it will exacerbate the bone loss (**choice b**).

(**Choice a**) Uncontrolled bleeding is not a common side effect of glucocorticoid therapy.

(Choice c) Purple striae are a common result of skin atrophy caused by chronic glucocorticoid use. Their appearance is common but is not the most pressing side effect associated with postmenopausal women.

(Choice d) Diabetes mellitus is a possible side effect of glucocorticoid therapy because steroids can alter the glucose metabolism in patients. While diabetes is a serious disease, it is not directly exacerbated by postmenopausal states.

(Choice e) Cataracts can occur with prolonged use of steroids, especially in children. The evaluation in a postmenopausal woman would not focus on cataracts, but on bone density.

2. Hormone replacement therapy (HRT) can be given to alleviate some of the symptoms of menopause including severe vasomotor flashes and vaginal dryness. Short-term therapy is generally initiated. If Ms Arras was suffering from these symptoms, how long can she safely take HRT?

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a. Less than 1 year
b. Between 2 and 4 years
c. Less than 5 years
d. Between 6 and 8 years
e. Less than 10 years.

Ans. c
Explanation: Severe postmenopausal vasomotor flashes can be treated with hormone replacement therapy (HRT). HRT can have significant adverse effects so short-term therapy is considered to be two to three years, but not more than five years due to the accumulating risks after that time **(choice c)**. Only those patients that experience symptoms that resume after treatment is discontinued and are debilitating to their quality of life should consider longer treatment options with HRT.

3. Most healthy patients are suitable candidates to receive HR, but there are certain subgroups which should not be prescribed HRT. Which of the following is *not* a contraindication to receive HRT?
a. History of breast cancer
b. Estrogen-associated migraine
c. Known coronary artery disease
d. History of deep vein thrombosis
e. Endometrial neoplasia.

Ans. b
Explanation: The estrogen that is included in the hormone replacement therapy can be the cause of many serious side effects. Because of this, there are many contraindications to HRT. These contraindications include history of breast cancer, active liver disease, endometrial carcinoma, known coronary artery disease, and a history of blood clots. Estrogen-associated migraines **(choice b)** are not a contraindication. These migraines are often caused by fluctuations in estrogen and actually decrease during normal menopause.

(Choice a) Breast cancers can be estrogen sensitive and proliferate more rapidly when estrogen is present. HRT are contraindicated in patients with a history of breast cancer because of the fear of recurrence.

(Choice c) HRT therapy can cause thrombotic events especially in the setting of atherosclerotic disease and for this reason it should be avoided in those with a known history of coronary artery disease.

(Choice d) Estrogen is a pro-thrombotic and will increase the risk of thromboembolism. Those patients who have already experienced clot formations should avoid HRT.

(Choice e) An endometrial tissue is sensitive to estrogen and will proliferate more rapidly in the presence of estrogen. For this reason HRT is contraindicated in patients with endometrial neoplasia.

4. Nulliparous women are at increased risk to develop the following types of cancer:
a. Cervical cancer, uterine cancer, and breast cancer
b. Ovarian cancer, breast cancer, and cervical cancer
c. Uterine cancer, fallopian tube cancer, and breast cancer
d. Breast cancer, uterine cancer, and ovarian cancer
e. Fallopian tube cancer, cervical cancer and breast cancer.

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Ans. d

Explanation: Nulliparous (G0P0) women are at increased risk to develop breast cancer, uterine cancer, and ovarian cancer as compared to multiparous women **(choice d)**. Several factors have been identified including the idea that prolonged exposure to endogenous estrogen increases the risk.

(Choice a) While uterine cancer and breast cancer are correct choices, cervical cancer is associated with higher risk in those women who are multiparous.

(Choice b) While ovarian cancer and breast cancer are correct choices, cervical cancer is associated with higher risk in those women who are multiparous.

(Choice c) Both uterine cancer and breast cancer are increased in women who are nulliparous, while parity is not a risk factor for fallopian tube cancer.

(Choice e) Breast cancer is increased in nulliparous women but that is not the case for either cervical or fallopian tube cancer.

Summary/Patient Introduction

Ms Irma Arras, a 66-year-old (G0P0) woman, presents to your office for her annual exam. Her obstetrical history is significant for nulliparity. On exam, it is important to screen for signs of malignancy in addition to managing her overall health. Nulliparous (G0P0) women are at increased risk to develop breast cancer, uterine cancer, and ovarian cancer as compared to multiparous women.

In a woman of postmenopausal age, symptoms of menopause need to be evaluated. Severe postmenopausal vasomotor flashes can be treated with hormone replacement therapy (HRT). HRT can have significant adverse effects, so short-term therapy is considered to be two to three years, but not more than five years due to the accumulating risks after that time. Her past medical history shows that she has never taken hormonal replacement therapy (HRT), but these drugs are contraindicated in some patients. These contraindications include history of breast cancer, active liver disease, endometrial carcinoma, known coronary artery disease, and a history of blood clots. Ms Arras also has rheumatoid arthritis for which she was taking steroids. A postmenopausal woman taking steroids is at an increased risk for developing osteoporosis due to the adverse affects of the steroids in conjunction with the physiologic loss of estrogen production.

Patient History

- **Menstrual history:** Menarche: 13 years; menstrual cycles: regular, 28/5; LMP: 15 years ago
- **Past medical history:** Unremarkable. Her last Pap smear was three years ago and was normal
- **Current medications:** None
- **Family history:** Significant for breast cancer (her mother and sister died of a breast cancer). Her mother had fractured hip
- **Social history:** Ms Arras is a clerk. She does not smoke or drink alcohol. There is no history of substance abuse.

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Questions/Patient History

1. Which of the following are *not* risk factors for osteoporosis?
   a. Generalized anxiety disorder
   b. Northern European or Asian descent
   c. Caffeine, cigarette smoking, excessive alcohol
   d. Amenorrhea and nulliparity
   e. Inflammatory bowel disease.

Ans. a
Explanation: While anxiety is not a recognized risk factor **(choice a),** interestingly depression is associated with an increased risk of osteoporosis. The rest of the answers are known risk factors for osteoporosis **(choices b-e)**.

2. Which of the following fracture types is least likely to be due to osteoporosis?
   a. Femoral neck fractures
   b. Vertebral fractures
   c. Skull fractures
   d. Distal radius fractures.

Ans. c
Explanation: Fractures less likely to be due to osteoporosis include open proximal humerus fractures, skull fractures, and facial bone fractures **(choice c)**. Femoral neck fractures, vertebral fractures, distal radius fractures are more likely to be due to osteoporosis **(choices a, b and d)**.

3. Based on our patient's age and menopausal status, which vitamin/supplement should our patient be taking daily to optimize bone health?
   a. Calcium
   b. Vitamin E
   c. Vitamin D
   d. a and c
   e. All of the above.

Ans. d
Explanation: It is recommended that postmenopausal women and men greater than 50 years old maintain adequate calcium intake (at least 1,200 mg/day) and vitamin D intake (800–1,000 units/day) **(choice d)**.

4. Your patient heard on television that she should increase her dietary calcium to maintain her bone health as she ages and is trying to implement several small changes in her diet to this end. Your patient knows that milk is a good source of Calcium but asks you which type of milk she should buy to get the most calcium per serving. Purchasing which of the following milk options will best meet her goal of increased calcium intake?
   a. Nonfat (skim)
   b. Low fat (1% milk fat)
   c. Whole milk
   d. Soy milk.

Ans. a
Explanation: Basic milk options on the shelves at groceries today follow the general rule—more fat means less calcium **(choice a)**.

For one cup of milk, calcium values follow: Nonfat 306 mg, low fat 290 mg, whole 276 mg, soy milk 93 mg. Calcium fortified dairy and soy products are also available in most supermarkets today, and may be practical options for patients seeking to optimize bone health for both the prevention and maintenance of bone health.

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Summary/Patient History

Risk factors for osteoporosis include Northern European or Asian descent, caffeine, cigarette smoking, excessive intake of alcohol, amenorrhea and nulliparity. Secondary causes of osteoporosis are hypercalciuria, hyperparathyroidism, hypogonadism, hyperthyroidism and Cushing syndrome.

When a patient with primary or secondary risk factors presents with a femoral neck fracture, vertebral fracture, or distal radius fracture, the underlying pathology is likely to be osteoporosis. GI and inflammatory disorders associated with low bone mass are: inflammatory bowel disease, celiac disease, gastric bypass surgery, primary biliary cirrhosis, rheumatoid arthritis, SLE and AS. Eating disorders, genetic disease such as Marfan's disorder, Ehlers-Danlos syndrome, homocystinuria, osteogenesis imperfect and marrow based disorders are also associated with low bone mineral density.

For both the prevention of osteoporosis and maintenance of bone health, it is recommended that postmenopausal women and men greater than 50 years old maintain adequate calcium intake (at least 1,200 mg/day) and vitamin D intake (800–1,000 units/day). Measures to increase dietary calcium can include the addition of calcium fortified products to the diet and/or the inclusion of more non-fat dairy products.

Investigations

- *General physical examination* was normal
- *Pelvic examination* revealed vaginal dryness. The rest of the examination was normal. Pap smear was obtained
- *List the most appropriate age appropriate investigations for Ms Arras.* Screening mammography, bone densitometry (central DXA) and colonoscopy.

Advantages of central DXA:

- Measures bone mineral density in the axial skeleton (spine) and the hip
- Cost-effective
- Radiation exposure is kept to a minimum.

Ms Aras's DXA scans are shown in Figs 4.1 and 4.2:

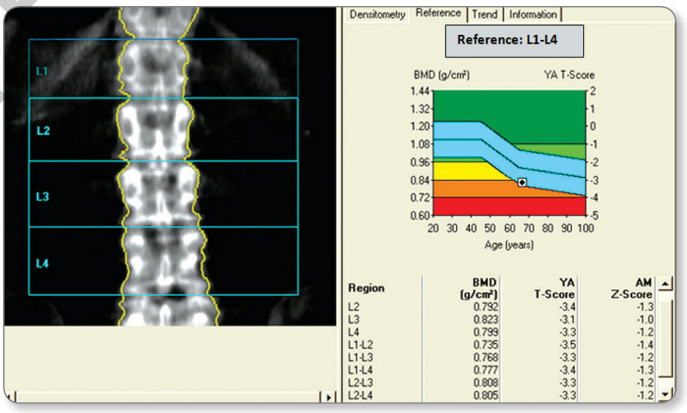


Fig. 4.1 DXA image of the lumbar spine showing osteoporosis, based on the T-score of -3.4 at L1-L4, applying WHO criteria for the diagnosis of osteoporosis

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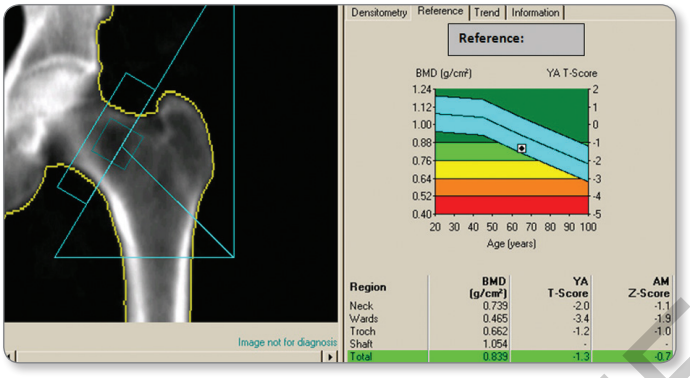


Fig. 4.2 DXA image of the left hip showing low bone mineral density (osteopenia), based on the T-score of -1.3 at total hip, applying WHO criteria for the diagnosis of osteoporosis

Questions/Investigations

1. A 68-year-old woman presents to her primary care physician for a routine checkup. The patient has no remarkable past medical or surgical history, and is not currently taking any medications. She entered menopause at the age of 51 and did not use hormone replacement therapy during that time. She is concerned about her risk of developing osteoporosis as her mother had the disease and suffered from a hip fracture when she was 70 years old. A dual energy X-ray absorptiometry (DXA) scan is ordered and subsequently the patient is diagnosed with osteoporosis. What is the most likely cause of osteoporosis in this patient?
   a. Deficient synthesis of type 1 collagen
   b. Deficient bone matrix mineralization
   c. Deficient bone formation relative to bone resorption
   d. Deficient acidification of the osteoclast resorption pit.

Ans. c

Explanation: Osteoporosis is a disease characterized by reduced bone mass, microarchitectural deterioration of bone tissue, normal bone mineralization, and an increased risk of fragility fractures. The disease can be categorized as either being primary or secondary, with the primary form including senile and postmenopausal osteoporosis. Secondary causes of osteoporosis include any medical condition or medication that accelerates bone loss.

An individual's peak bone mass is influenced largely by genetics with physical activity, muscular strength, diet, and hormonal status making significant contributions as well. Once a person reaches their peak bone mass, typically during the 3rd decade of life, a small decrease in bone formation relative to bone resorption begins to occur **(choice c)**. This discrepancy in bone turnover leads to a normal and predictable age-related decrease in bone mass. Bone cells from elderly individuals have reduced proliferative and biosynthetic capabilities and in turn predispose them to the senile variant of osteoporosis.

Postmenopausal osteoporosis is characterized by an estrogen dependent accelerated phase of bone loss that occurs during the decade after a woman's

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cessation of menses. Estrogen deficiency appears to result in increased synthesis of inflammatory cytokines that augment osteoclastic activity with osteoblasts not being able to compensate for the accelerated loss of bone mass.

(Choice a) This description best characterizes osteogenesis imperfecta which would be considered a secondary cause of osteoporosis.

(Choice b) This description best describes osteomalacia which is most often related to a lack of vitamin D.

(Choice d) This describes the underlying defect in most forms of osteopetrosis.

2. Which of the following would most likely be seen upon histological examination of a vertebral bone biopsy from a 65-year-old female patient with osteoporosis?
   a. Trabeculae that are thin, disconnected, and further apart than normal bone
   b. Trabeculae of normal thickness with a core of calcified bone covered by unmineralized osteoid
   c. Thickened trabeculae and lamellar bone arranged in a mosaic pattern
   d. Normal appearing bone.

Ans. a

Explanation: **(Choice a)** Though the diagnosis of osteoporosis is most often made via noninvasive methods the histologic appearance of postmenopausal osteoporosis is well known, and is described as normally mineralized bone with thinned trabeculae that are disconnected and spread apart. The microscopic appearance of senile osteoporosis differs somewhat from postmenopausal osteoporosis and is described as bone with a thinned cortex and widened Haversian systems.

(Choice b) This best describes the appearance of bone in a patient with osteomalacia.

(Choice c) This is the common description of bone from a patient with Paget's disease of bone.

3. A 67-year-old female patient who was recently diagnosed with osteoporosis has blood drawn for routine lab tests prior to initiating drug therapy. The patient has no other medical conditions and has never experienced a fracture. What calcium, phosphorus, and alkaline phosphatase values are expected to be found within her comprehensive metabolic profile?
   a. Decreased calcium, elevated phosphorus, and elevated alkaline phosphatase
   b. Normal calcium, normal phosphorus, and normal alkaline phosphatase
   c. Normal calcium, normal phosphorus, and elevated alkaline phosphatase
   d. Elevated calcium, decreased phosphorus, and increased alkaline phosphatase.

Ans. b

Explanation: In regards to primary osteoporosis an important feature of the blood chemistry is a lack of any abnormal findings **(choice b)**. The lab values in a patient with primary osteoporosis may show an elevated alkaline phosphatase for several months after a fracture, but the patient in the vignette had no such history.

Though the diagnosis of primary osteoporosis is not made by analysis of blood chemistry tests they are important in ruling out secondary causes of osteoporosis. A sound history and physical as well as laboratory work including a CMP, CBC, vitamin D levels, and urinary excretion of calcium is often adequate in excluding secondary causes of decreased bone mass.

(Choice a) This profile is consistent with that of renal osteodystrophy.

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(Choice c) This profile is consistent with that of Paget's disease of bone in which alkaline phosphatase values are markedly elevated.

(Choice d) This profile is consistent with that of a patient with primary hyperparathyroidism.

4. A 70-year-old African-American-female presents to the clinic for a routine checkup. The patient has rheumatoid arthritis and is on numerous medications including a corticosteroid. She is obese, leads a sedentary lifestyle, and smokes. The patient states that before she entered menopause at age 52 she had regular menstrual periods. During her visit the patient asks about her risk of developing osteoporosis. Which of the following from her history may contribute to the development of osteoporosis?

a. Race
b. Weight
c. Corticosteroid use
d. Menstrual history.

Ans. c

Explanation: Osteoporosis can develop due to failure to attain ones peak bone mass as a young adult and by bone loss during old age. Accelerated bone loss may occur in menopausal women, elderly men and women, and can be secondary to numerous disease states and medications. The patient in the vignette has multiple risk factors for the development of osteoporosis including long-term glucocorticoid therapy **(choice c)**, a history of smoking, advanced age, and rheumatoid arthritis.

(Choice a) African-Americans tend to have a lower risk of developing osteoporosis when compared to whites. This decreased risk may be due in part to attainment of a higher peak bone mass in early adulthood, a more efficient calcium economy, and lower bone turnover.

(Choice b) Low body weight (less than 58 kg [127 lbs.]) is an established risk factor for osteoporosis and fractures, while obesity on the other hand seems to have mixed effects upon the risk for fractures and osteoporosis. Many studies show that obese women tend to have greater bone mass than their age-related counterparts. The positive effects of obesity on bone mass in females may be due to increased mechanical loading of bone and the additional estrogen produced by adipocytes. However, the results of the Global Longitudinal Study of Osteoporosis in Women (GLOW) suggested that obesity is not protective against fracture in postmenopausal women and is linked to increased risk of ankle and upper leg fractures.

(Choice d) The patient's menstrual history was unremarkable. A history of prolonged amenorrhea or early menopause may have put the patient at an increased risk of developing osteoporosis.

Summary/Investigations

Osteoporosis is a disease characterized by reduced bone mass, microarchitectural deterioration of bone tissue, normal bone mineralization, and an increased risk of fragility fractures. The disease can be categorized as either being primary or secondary, with the primary form including senile and postmenopausal osteoporosis. Secondary causes of osteoporosis include any medical condition or medication that accelerates bone loss.

An individual's peak bone mass is influenced largely by genetics with physical activity, muscular strength, diet, and hormonal status making significant contributions as well. Once a person reaches their peak bone mass, typically during the 3rd decade

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of life, a small decrease in bone formation relative to bone resorption begins to occur. This discrepancy in bone turnover leads to a normal and predictable age-related decrease in bone mass. Osteoporosis can develop due to failure to attain ones peak bone mass as a young adult and by bone loss during old age. Accelerated bone loss may occur in menopausal women, elderly men and women, and can be secondary to numerous disease states and medications.

Postmenopausal osteoporosis is characterized by an estrogen dependent accelerated phase of bone loss that occurs during the decade after a woman's cessation of menses. Estrogen deficiency appears to result in increased synthesis of inflammatory cytokines that augment osteoclastic activity with osteoblasts not being able to compensate for the accelerated loss of bone mass.

The histologic appearance of postmenopausal osteoporosis is described as normally mineralized bone with thinned trabeculae that are disconnected and spread apart. The microscopic appearance of senile osteoporosis differs somewhat from postmenopausal osteoporosis and is described as bone with a thinned cortex and widened Haversian systems.

Primary osteoporosis normally lacks any abnormal blood chemistry findings unless a patient has experienced a fracture within the past several months and may exhibit an elevated alkaline phosphatase. The diagnosis of primary osteoporosis is not made by analysis of blood chemistry tests, yet they are important in ruling out secondary causes of osteoporosis. A sound history and physical as well as laboratory work including a complete metabolic profile (CMP), complete blood count (CBC), vitamin D levels, and urinary excretion of calcium is often adequate in excluding secondary causes of decreased bone mass.

Management

- Vitamin D 800–1,000 IU/day, Calcium 1,200 mg/day, bisphosphonates
- The following antiresorptive medications are FDA approved for the treatment of postmenopausal osteoporosis: alendronate, 10 mg po daily or 70 mg po once weekly, risendronate, 5 mg po daily or 35 mg po once weekly, ibandronate, 2.5 mg daily or IV push 3 mg quarterly, or 35 or raloxifene in a dose of 60 mg po daily. Salmon calcitonin is approved for treatment of women more than 5 years postmenopausal in a dose of 200 IU in one nasal spray daily. Zolendronic acid, 5 mg per year and denosumab, 60 mg sq every 6 months is approved for the treatment of postmenopausal osteoporosis. The anabolic agent teriparatide is approved for the treatment of postmenopausal osteoporosis in women who at high risk for fracture for a period of no more than 2 years at a dose of 20 micrograms injected subsequently daily
- Weight-bearing exercise to improve patient's strength and physical therapy to improve flexibility, posture and balance in order to prevent falls and maximize her physical function
- **Recommendation:** A repeat central DXA study is recommended in one year to assess therapeutic efficacy.

Questions/Management

1. A 57-year-old woman comes to your office for a routine health exam. Her last menstrual cycle was 2 years ago. Her husband has told her that she is moody

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all the time. She has no prior surgeries and takes no medications. She has a very stressful job and drinks 1 cup of coffee with cream every morning and drinks 3 beers every night. She walks a half hour every day and doesn't smoke. She is 5 foot 1 and weighs 195 pounds. Physical exam is unremarkable. Which of the following is the most significant risk factor for the development of osteoporosis in this patient?

a. High BMI
b. Coffee intake
c. Physical activity level
d. Alcohol intake.

Ans. d

Explanation: **(Choice a)** Obesity is actually protective against osteoporosis, as peripheral fat conversion of estrogen keeps an obese woman's estrogen levels higher than a thin woman's levels.

(Choice b) One cup of coffee with cream is not likely to cause low bone mineral density.

(Choice c) This woman participates in daily weight-bearing exercises, which decreases the risk of osteoporotic fractures.

(Choice d) Alcohol consumption causes a dose-dependent increase in the risk of osteoporotic fractures, and patients have a significant increase in their fracture risk if they are consuming more than 2–3 alcoholic drinks daily.

2. A 75-year-old woman has come into your office and is experiencing pain in her wrist. She cannot recall any trauma to the area and denies arthritis. What method is used to evaluate patients who are at risk for osteoporotic fractures?

a. Plain radiograph
b. DXA scan
c. CT scan
d. Biochemical markers of bone turnover.

Ans. b

Explanation: **(Choice a)** Plain radiography should not be used to monitor or evaluate osteoporotic risk. When plain films are interpreted as severe osteopenia, it is appropriate to suggest referral for dual-energy X-ray absorptiometry (DXA).

(Choice b) DXA scan is the current standard technique for the diagnosis of osteoporosis, due to its ability to measure bone mineral density at a variety of sites. It should normally be measured on two sites, preferably anteroposterior spine and hip (central DXA).

(Choice c) CT scan is not the test of choice.

(Choice d) Biochemical markers of bone turnover should have no role in the diagnosis of osteoporosis or in the selection of patients for BMD measurement.

3. A 65-year-old patient goes in for screening evaluation for osteoporosis. While she is on the table, the measurements are performed at two sites. Why do the measurement sites preferentially evaluate the hip and the anteroposterior spine?

a. The hip is the site used to monitor treatment
b. The forearm is another reliable measured site
c. The hip measurement does not relay the risk of spinal fracture
d. The spinal BMD is not reliable.

Ans. c

Explanation: **(Choice a)** The spinal measurement is the site used to evaluate the patient's response to treatment.

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(Choice b) The forearm, while sometimes measured, is not a reliable predictor of osteoporosis.

(Choice c) BMD measurement at the hip give the best prediction of hip fracture risk but does not exclude the possibility that the patient has osteoporosis at lumbar spine.

(Choice d) While the spinal BMD is reliable, measuring it alone will not give an adequate picture of the patient's risk for hip fracture. The spinal T score is compared for the individual vertebrae to evaluate other factors that may affect the result, like vertebral fracture or degenerative changes.

4. A 65-year-old Caucasian woman presents to your office with a fracture from a fall from a low step stool. She has been your patient for 10 years and you know from her medical history that she takes Calcium and vitamin D supplements, is on no other medications. She smokes a pack a day for the last 20 years but does not drink. You also note that she has had weight loss of 20 pounds in the last year. She says that she is performing the weight-bearing exercises as you suggested but has not been trying to lose weight. Which of the following is a nonmodifiable risk factor for osteoporosis in this patient?

a. Medications
b. Race
c. Malnutrition
d. Smoking.

Ans. b

Explanation: **(Choice a)** The patient is not taking any medications that increase the risk of osteoporosis. Vitamin D and calcium help prevent osteoporosis.

(Choice b) Caucasian race is a nonmodifiable risk factor for osteoporosis.

(Choice c) Malnutrition is a modifiable risk factor in osteoporosis. Patient's nutrition levels, as well as medical evaluations should be performed if there seems to be unwanted weight loss.

(Choice d) Smoking is a modifiable risk factor for osteoporosis.

Summary/Management

The risk factors for the development of osteoporosis can be subdivided into 2 subgroups: modifiable and nonmodifiable.

Modifiable risk factors include normal factors like low estrogen levels, malnutrition, decrease calcium, decreased vitamin D, use of certain medications patients such as glucocorticoids or anticonvulsants, immobility, cigarette smoking and excessive alcohol consumption.

Nonmodifiable risk factors include female gender, advanced age, small body size, late menarche/early menopause, Caucasian and Asian race, and family history of osteoporosis.

Patients at risk for osteoporosis should be encouraged to make lifestyle modifications including weight-bearing exercise, smoking cessation, and decrease alcohol consumption.

Dual-energy X-ray absorptiometry (DXA scan) is the current standard technique for the diagnosis of osteoporosis, due to its ability to measure Bone Mineral Density at a variety of sites. It should normally be measured on two sites, preferably anteroposterior spine and hip.

The two sites allow the physician to evaluate both the patient's risk for hip fracture and the risk for vertebral fracture. The spinal measurements are followed to evaluate the effectiveness of interventions.

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Follow-up

- A repeat central DXA study is recommended in one year to assess therapeutic efficacy
- According to National Osteoporosis Foundation (NOF), patients 50 years and above require 1,200 mg of calcium and 800 to 1,000 vitamin D daily.

Questions/Follow-up

1. Once a week dosing of alendronate (bisphosphonates) causes _____ as compared to daily dosing:
   a. More adverse upper GI events
   b. Less new bone formation
   c. Higher rates of clinical fractures
   d. Similar rates of improvement and adverse events.

Ans. d
Explanation: There seems to be no difference in the beneficial outcomes or adverse events between once daily and weekly alendronate dosing **(choice d)**.
(Choice a) Daily and weekly doses of alendronate have similar side effects.
(Choice b) Both forms show increased bone mineral densities over a 2 year period.
(Choice c) Both forms show reduction in clinically apparent fractures over 2 years.

2. What is a generally accepted threshold for low body weight associated with risk for osteoporosis?
   a. 50 kg (110 lb)
   b. 54 kg (120 lb)
   c. 58 kg (127 lb)
   d. 62 kg (132 lb).

Ans. c
Explanation: Although bone density and muscle mass reach peaks at different stages in development there is a strong correlation between BMI and base line bone mineral density. Though multiple sources use different cut off values the most widely accepted cut off for weight as a risk factor is below 58 kg (127 lb) this data also correlates to a BMI of roughly 22 or below **(choice c)**.

3. What is the 1 year mortality for hip fractures in the general elderly population?
   a. 5%
   b. 8%
   c. 20%
   d. 50%.

Ans. c
Explanation: A hip fracture is a leading cause of morbidity and mortality in elderly patients. Multiple studies have been done about mortality in hip fractures with varying results but approximately 20% mortality at one year is an accepted figure **(choice c)**.
(Choice a) 5% is the 3 month mortality in elderly women.
(Choice b) 8% is the 3 month mortality in elderly men.
(Choice d) Almost half the elderly patients who suffer a hip fracture never regain independent living.

4. If 66-year-old postmenopausal patient has T-score below – 2.5 at femoral neck, what would be a reasonable alternate 1st line treatment?
   a. Hormonal replacement therapy
   b. Raloxifen
   c. Alendronate
   d. PTH.

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Ans. c

Explanation: Alendronate and other drugs in this class are the 1st line therapy in the general population **(choice c)**.

(Choice a) Hormone replacement therapy improves bone mineral density in perimenopausal patients, but should never be used in late menopause.

(Choice b) Raloxifen is a SERM that has an estrogenic effect on bone but opposes the effects of estrogen in the uterus and breast. It is not a first line agent in the general population because while it does reduce vertebral fractures there is limited evidence that it reduces other higher risk fractures as effectively as the bisphosphonates.

(Choice d) PTH therapy is reserved for patients with very severe oesteoporosis who cannot take bisphosphonates or who have suboptimal results with 1st line therapies.

Summary/Follow-up

The 1st line medical therapies for osteoporosis are the bisphosphonates. Alendronate, Risendronate and Zolendronic acid are the most commonly used bisphosphonates. Because of their extraskeletal side-effects, these medications must be taken before eating in the morning with a large glass of water, and the patients must remain upright for at least 30 minutes. The most serious complications of bisphosphonates are osteonecrosis of the jaw, musculoskeletal pain, and hypocalcemia. Both daily and weekly forms show increased bone mineral densities and decreased fractures over a 2-year-period.

Raloxifen is a SERM that has an estrogenic effect on bone but opposes the effects of estrogen in the uterus and breast. It is not a first line agent in the general population because while it does reduce vertebral fractures there is limited evidence that it reduces other higher risk fractures as effectively as the bisphosphonates.

PTH therapy is reserved for patients with very severe osteoporosis who cannot take bisphosphonates or who have suboptimal results with 1st line therapies.

A hip fracture is a leading cause of morbidity and mortality in elderly patients with a 20% mortality at one year and almost half the elderly patients who suffer a hip fracture never regain independent living. And remember that a weight below 58 kg or BMI of 22 is associated with a higher risk for osteoporosis.

Learning Objectives

Clinical Presentations: Menopause/Osteoporosis

Patient History/History of Present Illness

1. Recognize osteoporosis risk factors.
2. List secondary causes of osteoporosis.
3. Know the risk factors for hormone replacement therapy.
4. List contraindications for the use or hormone replacement therapy.
5. Know short and long-term effects of hormone replacement therapy.
6. Recognize common fractures in osteoporosis.
7. Recognize current recommendations for calcium and vitamin D supplementation in the postmenopausal population.
8. Be able to offer practical strategies for increasing ones calcium and vitamin D dietary consumption.

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Investigations and Pathophysiology

9. Know the pathophysiology of primary osteoporosis.
10. Know the microscopic appearance of both postmenopausal osteoporosis and senile osteoporosis.
11. Know what the laboratory findings in a patient with primary osteoporosis should be, and how to evaluate for secondary causes of osteoporosis.

Diagnosis and Management

12. Define modifiable and nonmodifiable risk factors for osteoporosis.
13. Define the diagnostic method of choice in osteoporosis.
14. Know how to interpret DXA findings.
15. Be able to relate why the two DXA measurement sites are preferred.

Follow-up

16. Know the morbidity and mortality associated with hip fractures in the elderly.
17. Know the treatments for osteoporosis.
18. Be able to correlate weight and BMI to fracture risk in the elderly.

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