

Case Study

A 40-year-old woman is found to have Osteopenia on a routine chest x-ray. She has a long history of Crohn's disease. Her daily calcium intake is 1200 mg daily. Bone mineral density shows T score of - 2.6 in the hip.

Labs include calcium 8.4 mg/dl, phosphorus 2.7 mg/dl, alk phos 167 U/l, 25-hydroxyvitamin D 18 ng/ml, PTH 78 pg/ml.

Which of the following is the most appropriate initial therapy for this patient?

1. A bisphosphonate
2. Vitamin D replacement
3. Calcitonin
4. Parathyroidectomy

 Answer: 2. Vitamin D replacement

25-hydroxyvitamin D levels are related to bone density. *Measure 25-hydroxyvitamin D (25-OH-D) levels in patients with Osteopenia or osteoporosis.*

Levels for 25-hydroxyvitamin D (25-OH-D) levels

- * Less than 20 ng/ml: deficient.
- * ≤ 30 ng/ml: associated with increased PTH, decreased intestinal calcium absorption.
- * > 30 ng/ml: sufficient
- * 40 ng/ml or more: associated with maximum bone density
- * 150 ng/ml or more: intoxication

Never use the 1, 25 dihydroxyvitamin D assay to detect vitamin D deficiency:

- * Dihydroxyvitamin D (1, 25,-OH-D) is **not** active form of vitamin D
- * Lab will be normal or elevated due to secondary hyperparathyroidism.
- * Produced by the kidney which is stimulated by PTH

Vitamin D deficiency is common

- * More than 50% of postmenopausal women on meds for osteoporosis had 25-hydroxyvitamin D (25-OH-D) levels below 30 ng/ml.
- * 52% of Hispanic and black adolescents in Boston had 25-hydroxyvitamin D levels below 20 ng/ml

Expert recommendations: Without adequate sun exposure, children and adults require 800 IU - 1000 IU of vitamin D daily.

Cost effective ways to correct vitamin D deficiency:

* Vitamin D2 (ergocalciferol) 50,000 IU once or twice weekly for 8 weeks. Repeat for another 8 weeks if level < 30. Also, monitor alkaline phos, BUN, calcium, magnesium, PO4, DXA. Maintain on 50,000 IU once monthly. (If Vitamin D2 deficiency due to hypoparathyroidism, start 50,000 IU po daily.)

* Vitamin D2 3000 IU daily.

* Vitamin D3 1000 IU daily.

(Vitamin D2 is 30% as effective as vitamin D3. Therefore, up to 3 times as much vitamin D2 may be needed.)

Treat patients with adequate vitamin D and have a low threshold for checking levels.

Case Study

Susie was adopted from Ethiopia 1 month ago. Brought to ER by mother because of refusal to walk. Mother told ER physician that Suzie fell off the bed. She began walking 1 month ago. Muscles seem weak. Has first appt. with her pediatrician next week. Was told by agency all tests were normal in Ethiopian orphanage.

ER MD elicited that she was drinking whole milk and taking multivitams daily. Good appetite and taking all solids well. Exam revealed tenderness over right ankle. X-ray showed a greenstick fracture of fibula. The ER physician became suspicious and returned to the patient for further examination.


What do you most suspect?

1. Lead poisoning
2. Child abuse
3. Vitamin D deficiency
4. HIV
5. Parasitic infection

 Answer: 3. Vitamin D deficiency

Which tests most diagnostic to rule out Vitamin D deficient Rickets?

1. Calcium, phosphate, & alkaline phosphatase
2. Bone x-rays, PTH, & calcium
3. Bone x-rays, phosphate & 25-hydroxyvitamin D (25-OH-D)
4. Bone x-rays, calcium & dihydroxyvitamin D (1, 25,-OH-D)

 Answer: 3. Bone xrays, phosphate & 25-hydroxyvitamin D level

(Dihydroxyvitamin D is not active form.)

Rickets: healing can respond as early as three weeks with vitamin D.

Clinical Features of Rickets:

Craniotables, delayed closure of AF
Costochondral junction-rachitic rosary (secondary swelling)
Pectus carinatum, Harrison groove
Delayed development-muscle weakness
Wrist, ankle-epiphyseal enlargement

Risk Factors for Rickets:

Darker skinned ethnic groups
International adoptees
Exclusively breastfed infants (unless weaned to > 500 ml/day if fortified formula or milk should receive 200 IU Vitamin D day.)
Low milk/dairy intake
Vegan diet
Living in cold climates

Labs in Vitamin D deficient Rickets:

Decreased

Phosphorus
Calcium (+/-)
Hydroxyvitamin D (25-OH-D)

Increased

Alkaline phosphatase
PTH
Dihydroxyvitamin D (1, 25,-OH-D)
(All the bone activity increases alk. Phosphate level.
Parathyroid will increase production if it detects low vitamin D levels.)

Reference:

Holick, MF. Vitamin D Deficiency. New England Journal of Medicine; 357:266.