Photo Quiz
Self-Test Your Diagnostic Acumen

Are the Findings in These Boys Signs of Malnutrition?

Case 1: 13-Month-Old With Bowed Legs
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During a well-child visit, the mother of a 13-month-old boy expresses concern about her son’s bowed legs. He had been exclusively breastfed until age 6 months. He is still breastfed at 13 months. The child lives in Michigan with his family. His medical history is unremarkable.

Examination reveals an otherwise healthy African-American boy with genu varum. Radiographs of the wrists are ordered.

Case 2: 4-Year-Old With Constipation and Pebbles in Stool
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The mother of a 4-year-old boy is concerned about his habit of eating stones and wall plaster; the habit has persisted for the past year. The child has a tendency toward constipation. He recently had abdominal pain and some discomfort with defecation. Small pebbles have been noted in the child’s stool. His family is of low socioeconomic status; his mother, a single parent, receives social assistance.

Physical examination findings are unremarkable. An abdominal radiograph is obtained.

What caused these radiographic anomalies?

(Answers and discussion begin on next page.)
The radiograph shows cupping, fraying, and widening of the metaphysis. Further evaluation reveals normal blood calcium and phosphorus levels; however, the level of alkaline phosphatase is markedly elevated and the 25-hydroxyvitamin D level is very low at 5 ng/mL. This child had not received vitamin D supplementation, was dark-skinned, and lived in Michigan where he spent most of his first 12 months of life indoors with a lack of sun exposure—factors that point to a diagnosis of vitamin D deficiency rickets.

Breast milk alone does not provide infants with an adequate intake of vitamin D. The lack of vitamin D is partially mitigated by exposure to sunlight. Although vitamin D synthesized through routine sunlight may be sufficient for many infants, it is not enough for some breastfed infants, particularly those with certain factors. These factors include the amount of skin pigmentation, body mass, degree of latitude, season, the amount of cloud cover, the extent of air pollution, the amount of skin exposed, and the extent of UV protection (such as clothing and sunscreens), all of which decrease the amount of vitamin D synthesized from sunlight.

With concerns about excess sun exposure causing skin cancer and efforts to limit sunlight exposure and inconsistent sun exposure in the United States, especially in northern latitudes (where this patient lived), the American Academy of Pediatrics (AAP) has recommended a daily intake of 400 IU of vitamin D per day for all infants and children beginning in the first few days of life.

To ensure that this daily requirement is met, the AAP recommends the following:

• A supplement of 400 IU/day of vitamin D should begin within the first few days of life and continue throughout childhood.

• Any breastfeeding infant, regardless of whether he or she is being supplemented with formula, should be supplemented with 400 IU of vitamin D, because it is unlikely that a breastfed infant would consume 1 L (about 1 qt) of formula per day, the amount that would supply 400 IU of vitamin D.

Skeletal manifestations associated with rickets are seen first at growth plates of rapidly growing bones (eg, wrists, knees). Patients can have enlarged wrists and ankles and bowing of legs. Widening of the epiphysial plates is an early radiographic change. This may progress to cupping, splaying, or stippling of the metaphyses. With severe disease, the shafts of long bones become osteopenic and predispose patients to pathological fractures.

This child was treated with ergocalciferol, 1000 IU bid for 2 weeks, followed by ongoing supplementation with 400 IU daily. In 2 weeks, the alkaline phosphatase and vitamin D levels had normalized. A treatment period of 2 weeks is typical before repeating radiographs. For this boy, a second set of radiographs obtained at 4 weeks showed response to treatment.

REFERENCES:
The radiograph shows multiple round densities, suggestive of pebbles. Air is present throughout the bowel; there is no sign of obstruction. Laboratory studies reveal a hemoglobin level of 11.3 g/dL, an iron level of 28 μg/dL, and a ferritin level of 5 ng/mL. Mean corpuscular volume was 74 fl, mean corpuscular hemoglobin concentration, 32.2 g/dL; red blood cell count, 47,200/μL; and platelet count, 484,000/μL.

Pica involves repeated or chronic ingestion of nonnutritive substances (such as plaster, charcoal, clay, wool, ashes, paint, and dirt) for at least 1 month. Its name comes from *Pica hudsonia*, the Latin term for magpie—a bird that is believed to eat almost anything. The basis of this unusual craving for non-food items remains obscure.

Specific nutritional deficiencies of particular trace elements may trigger the behavior. Iron deficiency is frequently associated with pica. In addition, pica is common in infants and children who require prolonged (more than 1 month) total parenteral nutrition and receive no enteral nutrition.

There can be many adverse medical consequences of pica depending on the type of substance ingested. Accumulation of ingested pebbles in the colon can lead to intestinal obstruction.

This child was treated with parenteral iron, because he refused oral iron. His GI symptoms gradually resolved, as did his pica. The iron deficiency was thought to be the cause of his pica. Consultations with a mental health counselor and nutritionist were recommended.

REFERENCES: