Painful Lower Extremities Related to Diaphyseal Dysplasia: Genetic Diagnosis and Treatment

To the Editor:

Camurati-Engelmann disease (CED) is an autosomal-dominant condition, initially described by Cockayne in 1920. Camurati was the first to suggest the hereditary component in 1922, when he reported a rare symmetrical osteitis of lower limbs in a father and son and several others in a total of 4 generations. Later, Engelmann reported a case with muscular wasting and important bone involvement. The disease begins in an age span between 3 months and 50 years old, with higher prevalence in males. It is characterized by progressive cortical expansion, sclerosis, and symmetrical hyperostosis affecting the diaphyses of the long bones. We describe a case of CED in a female patient with lower limb pain with progressive worsening and difficult diagnosis.

A 37-year-old woman from Manaus, Brazil, was referred for investigation of a 5-year history of fatigue, headache, and pain in both legs, worsening over the preceding year, that had not responded to a variety of analgesics. The initial investigation included the following: normal blood count, erythrocyte sedimentation rate 15 mm/h (ESR; normal 0 to 20); rheumatoid factor 47 IU/ml (normal 10 IU/ml), C-reactive protein 10.3 mg/dl (normal < 8 mg/dl), a negative antinuclear factor, alkaline phosphatase 111 U/l (normal 38–126 U/l); serum calcium was 8.7 mg/dl (normal 8.4–10.6), ionized calcium 1.42 (normal 1.2–1.6), urinary calcium 421 mg/24 h (normal 200), inorganic phosphorus 2.8 mg/dl (normal 2.5–4.5), parathyroid hormone 62 pg/ml (normal 7–53); and negative Bence-Jones proteins and normal urinary sediment.

Radiographs of both lower limbs showed cortical thickening at the diaphyses, the medium third of the tibias, and distal third of the right and left middle femur causing obliteration of the medullary cavity (Figure 1); these alterations were confirmed by computed tomography (CT; Figure 2). Radiographs of the forearms were normal. Bone scintigraphy revealed asymmetrical increased uptake in the tibias, femurs, and humerals (Figure 3A, 3B). Biopsy of the tibias and right femur revealed typical osteoclasts, and osteoblasts distributed in a circle, compatible with hyperostosis and absence of malignancy. Examination revealed proximal muscle weakness (68%); other important features were waddling gait (48%), easy fatigability (44%), and generalized muscle weakness (39%), or an asymptomatic presentation. Campos-Xavier, et al. found no obvious

Figure 1. A and B Radiographs of both lower limbs, with cortical thickening at the diaphysis in the medium third of the tibias, medium third of the right and left femur, causing obliteration of the medullary cavity.
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The correlation between the manifestation of TGF-β1 mutations and the severity of the clinical manifestations of CED. Laboratory findings (anemia, leukopenia, and elevated ESR) are not specific and occur occasionally. Abnormal values for markers of bone resorption have been reported.

The radiological changes include symmetrical endosteal and subperiosteal cortical thickening, and involve primarily the diaphyses, and may extend to the metaphysis but spare the epiphyses. Typically the long bones, especially the femur and tibia, are affected, but skull, mandible, pelvis, and vertebral involvement is recognized. Scintigraphy examination exposed increased osteoblastic activity in the affected regions (limbs, pelvis, skull).

As clinical and radiological variability is extensive, molecular analysis can provide an additional resource for a correct diagnosis. Molecular genetic study was done through polymerase chain reaction and direct sequencing of the coding exons of the TGF-β1 gene located in chromosome 19q13.

The differential diagnosis includes consideration of hereditary multiple diaphyseal sclerosis (Ribbing disease) and the group of the endosteal hyperostoses (Van Buchen, Worth, Nakamura, and Truswell-Hansen diseases). Other cranial-facial conditions resulting from osteodysplasias include Paget disease, fibrous dysplasia, especially in its pagetoid or sclerotic forms (in dysplasia there is expansion to the medullary cavity), osteogenesis imperfecta (van der Hoeve syndrome), and exostosis and exuberant osteoma, among others.

There is no specific treatment for CED. NSAID such as aspirin can alleviate pain, but are ineffective at improving bone changes. Corticosteroids have been reported to provide effective symptomatic improvement. Corticosteroids are antiinflammatory and immunosuppressive agents in bone, but decrease density (1) by increasing the apoptosis rate of osteoclasts and osteocytes while suppressing osteoblast proliferation, differentiation, and bone matrix synthesis; (2) by enhancing proliferation and differentiation of osteoclast precursors; and (3) by decreasing intestinal calcium absorption. Moreover, they change the activation/expression in TGF-β1 receptors, inhibiting the induced transcription of the gene. The initial dose of prednisone is 1 mg/kg/day, with progressive tapering and maintenance at 5 to 10 mg/day. Longterm steroid therapy is not recommended due to the secondary effects, including osteoporosis. Deflazacort, a steroid with an antiinflammatory effect similar to prednisolone but with fewer adverse effects, was started in a dose of 1.2 mg/kg/day and resulted in clinical and radiological improvement within 12 months with no side effects. Deflazacort may be a safe alternative steroid therapy.

Biphosphonate reduced bone reabsorption, but its value in treatment of CED is disputed. The use of pamidronate in CED has been reported, some reports describing worsening of bone pain, others describing improvement in clinical symptoms of bone pain. Surgery is an alternative to drug therapy, with reaming of the medullary canal or osteotomy. Physiotherapy is important for increasing motor amplitudes and muscle strength.

In summary, CED should be considered in the differential diagnosis of nonspecific limb pain along with other musculoskeletal diseases.

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Figure 2. CT of lower limbs showing cortical thickening at the diaphysis in the medium third of the tibias, medium third of the right and left femur, causing obliteration of the medullary cavity.

Figure 3. Bone scintigraphy revealed asymmetrical increased uptake in tibias, femurs, and humerus.

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REFERENCES