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Original contribution

Dysplasia epiphysealis hemimelica (Trevor disease): a rare developmental disorder of bone mimicking osteochondroma of long bones

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Summary Dysplasia epiphysealis hemimelica (DEH) is a rare developmental disorder of childhood and is characterized by asymmetric enlargement of the epiphyseal cartilage of the long bones. After 4 to 5 years of age, the lesions histologically resemble osteochondroma. To our knowledge, only one publication of this entity is available in an English pathology journal. The clinical, radiographic, and histologic features of 9 cases of DEH were retrospectively reviewed. The patients' age ranged from 3 to 15 years with single or multiple lesions of the femur, fibula, tibia, and talus. The etiology and pathogenesis of DEH are not known. Its origin and evolution has initially apparent similarities to the development and growth of epiphyseal secondary ossification centers. DEH can be differentiated from osteochondroma of long bones using clinical, radiologic, and pathologic parameters. DEH occurs in young children and adolescents manifesting as lesions that arise particularly from the epiphysis of the lower extremities and tarsus. Osteochondroma, in contrast, occurs most frequently between 10 and 30 years of age and originates from the metaphysis of long bones. Although the DEH cartilage resembles osteochondroma, there are several significant histologic differences. During infancy, lesions of DEH histologically reveal osteocartilaginous nodules that resemble secondary ossification centers. Usually after 4 to 5 years of age they develop into osteochondroma-like lesions. Although all cases of DEH contain small areas of calcified cartilage beneath the cartilage cap, a significant percentage of osteochondromas show large amounts. The nodules and cartilage cap of DEH contain bands of cartilage separating areas of cancellous bone; these bands are not present in osteochondroma. Among the other distinguishable features, recent molecular studies of DEH demonstrated normal expression levels of *EXT1* and *EXT2* genes, comparable to that of normal growth plate. Osteochondroma, in contrast, has low levels of *EXT1* and *EXT2* gene expression due to gene mutation. The histologic differences in combination with the distinct clinical and radiographic features should enable a pathologist to differentiate these entities.

1. Introduction

Dysplasia epiphysealis hemimelica (DEH) is a rare developmental disorder of childhood first described by Mouchet and Belot [1] in 1926, who initially named the

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lesion *tarsomegalia*. DEH has also been referred to as Trevor disease since Trevor [2] recognized this condition as a distinct entity in 1950, calling it tarso-epiphyseal aclasis. The term *dysplasia epiphysealis hemimelica* was coined by Fairbank [3] in 1956. The disease is characterized by cartilaginous overgrowth affecting the epiphysis of the long bones, particularly of the lower extremities and the tarsus. It is usually restricted to one side of the epiphysis (hemimelic), particularly the medial side [4,5]. Because of histologic similarities to osteochondroma of long bones, other terms

Table 1 Clinicopathologic data of patients with DEH

Case	Age and sex	Clinical data	Location	Radiology	Pathology
1	3, M	Painless mass in right knee with progressive valgus deformity	Medial femoral and tibial epiphyses, right knee	Two calcified areas, one adjacent to the femoral epiphyses and the other attached to the tibial epiphyses	Cartilaginous nodules, one containing a small ossification center measuring 0.4 × 0.3 in diameter
2	3, F	Intra-articular mass in right knee. The patient developed a recurrence 3 y later.	Right proximal tibia	No x-rays available from initial treatment at 3 y of age	Osteocartilaginous nodules with ossification centers
3	4, M	Painful mass present for 3 mo	Left distal tibia and talus, anteromedial region	Multiple calcified densities adjacent to the distal tibial epiphysis and talus; secondary pressure erosion of the talus	Osteocartilaginous nodules, some containing ossification centers 0.4 cm in diameter; bands of cartilage measuring 0.1-0.2 cm separate several nodules
4	4, F	Swelling of the medial aspect of left ankle for 3-6 wk, limping with pain	Left medial talus	Several calcified areas arising from left talus medially	Osteocartilaginous nodules, some separated by cartilage bands measuring 0.1 cm
5	4, F	Swelling of the right ankle since 2 y of age; at 3 y of age, had removal of "osteocartilaginous tissue" from the right ankle; recurrent swelling	Right distal fibula, tibia and talus, lateral	Multiple calcified areas in the region of the distal fibula and lateral talus; osteochondroma of distal metaphysis of fibula	Osteocartilaginous nodules, osteochondroma of distal metaphysis of fibula
6	7, M	Swelling of left ankle	Left distal fibula and lateral talus	Multiple calcified areas adjacent to distal fibula and anterolateral region of talus, secondary pressure erosion of talus	Osteocartilaginous nodules, some containing small ossification centers; cartilage bands measuring up to 0.3 cm separate the nodules
7	5, F	Asymptomatic mass in the left ankle initially noticed at 1 1/2 y of age, slowly increasing in size	Left medial talus	Calcified mass adjacent to medial aspect of left talus	Osteocartilaginous tissue with osteochondroma-like appearance, cartilage cap measures 0.4 cm
8	8, M	Abnormality of the right ankle with progressive enlargement, pain, and deformity	Right distal fibula and lateral talus	Calcified masses in posterior aspect of lateral ankle joint, also irregularity of right distal femoral epiphysis noted at 2 y of age	Fragments of irregular osteocartilaginous tissue with osteochondroma-like appearance. Cartilage cap measures 0.15 cm. Cartilage band is present within the bone.
9	15, M	Limitation of motion in right hip, knee, and ankle joints; firm mass in posterior aspect of right knee with atrophy of quadriceps muscle; history of excision of right ankle "tumor" on 2 occasions	Right proximal and distal femur, right proximal tibia, right distal fibula and talus	Ossified masses in lateral and medial regions of proximal femur, lateral femoral epiphysis, posterolateral aspect of tibial plateau, distal fibula and lateral tarsal bone. Patient had additional features of melorheostosis and osteopathia striata [9]	Large fragments of osteocartilaginous tissue removed on 3 different occasions have osteochondroma-like appearance. The cartilage cap measures 0.15-0.2 cm. The cartilage bands in the 3 specimens measure 0.1 cm.