Case Report

A CHILD WITH INCREASED BONE DENSITY: OSTEOPETROSIS

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ABSTRACT

Osteopetrosis is a rare disorder characterized by abnormal resorption and remodelling of bones owing to the defective osteoclastic activity. In some cases it may be asymptomatic and diagnosed accidentally. Here, we present such a case of osteopetrosis where we suspected the disease from the chest roentgenogram of the patient. Then the typical osteosclerotic changes in the skeletal survey of the patient confirmed our diagnosis of osteopetrosis.

Key Words: Osteopetrosis, Osteoclasts, Bone resorption.

INTRODUCTION

Osteopetrosis is a disorder of resorption and remodelling of bones due to a defect in the functions of osteoclasts. The disease may be inherited as an autosomal dominant or recessive trait or , in few cases, it may result from spontaneous mutations. Typical osteosclerotic changes on roentgenograms confirm the diagnosis of osteopetrosis when it is suspected clinically. The most common clinical manifestations of the disease are: macrocephaly, frontal bossing, prognathism, nistagmus, visual impairment, hearing loss, growth retardation, pathological fractures even after a mild trauma, recurrent infections, anemia, trombocytopenia and hepatosplenomegaly. Supportive treatment is essential, but the definitive treatment is bone marrow transplantation.

CASE REPORT

A 3-year-old girl was admitted to our clinic with a history of coughing, high grade fever and anorexia. There was no problem in her prenatal, natal and postnatal history. She was the only child of a 36 year-old healthy mother and 38 year-old healthy father who were first degree relatives. No chronic illness was described in the family.

On physical examination; her weight was 11 kg.(10 percentile), height was 82 cm.(3-10 percentile) and head circumference was 50 cm.(90 percentile). Her axillary temperature was 38.5°C and she had dispnea. Besides, she had pallor, exophtalmos, horizontal nistagmus, frontal bossing, caput quadratum, prognathism and pigeon chest deformity. Chest auscultation revealed fine rales. Cardiovascular examination was normal. She had no hepatosplenomegaly and lymph node enlargement. Extremities appeared normal. Her neuromotor development was also normal.

Laboratory evaluation revealed iron deficiency anemia with the parameters of hemoglobin 9.7 gr/dl, hematocrit 29%, mean corpuscular volume 70 fl, RDW: 19%, serum iron level 12 mcg/dl and total iron binding capasity 193 mcg/dl. On peripheric blood smear, neutrophils were

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dominant, leucocytes and erithrocytes were hypochromic and microcytic. Her serum calcium (8.6 mg/dl) and phosphorus (2.6 mg/dl) levels were decreased, whereas the alkaline phosphatase level (1020 IU/L) was increased. C reactive protein was positive. Erythrocyte sedimentation rate was 36 mm./hour.

Thyroid function tests were normal. In her blood culture, Streptococcus Pneumoniae was identified. Bone marrow was hypocellular with a decreased number of megacaryocytes. Her bone age was compatible with her chronological age. Total bone density was (1.13 gr/cm^2) increased. The chest roentgenogram revealed right lobar pneumonia and enlargement in costochondral joints. Distinctive sclerotic bony changes on the chest X-ray alerted us (Fig. 1). The chalky and dense appearance of the ribs betrayed osteopetrosis. Skeletal roentgenograms were performed in order to confirm the diagnosis. Cranial, cervical, vertebral and long bone roentgenograms revealed characteristic deformities of osteopetrosis and diffuse sclerosis. In lateral craniograms, the base of the skull was markedly thickened and dense (Fig. 2). Typical changes of osteopetrosis with increased bone density and loss of corticomedullary differentiation giving the "bone in bone" appearance of metacarpals were present on the X-rays.

Deafness and optic atrophy were not present on audiometric and ophthalmoscopic examinations. The case was discharged after a ten day course of antibiotics. We planned to follow up from outpatient clinics, however, the family did not follow our instructions.

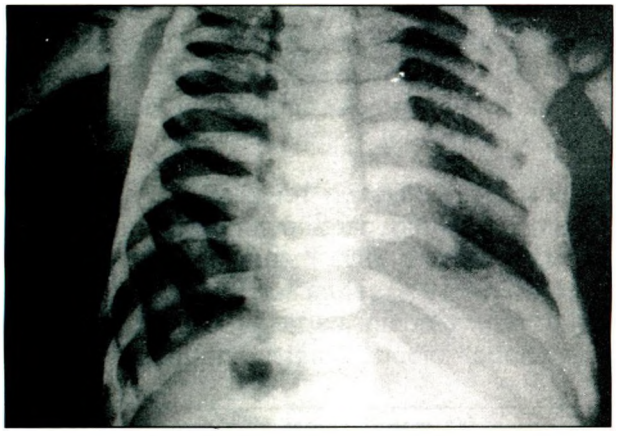

Fig. 1: Chest radiograph: Typical increased bone density and bone-in-bone appearance in osteoppetrosis.

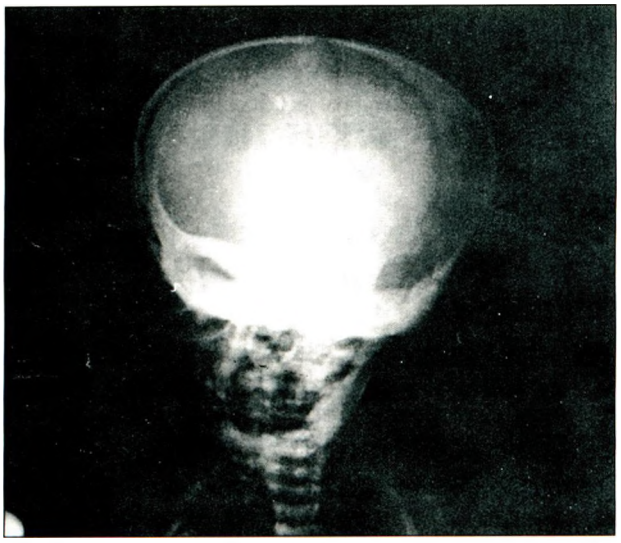

Fig. 2: Craniogram: Eye glasses appearance caused by increased density.

DISCUSSION

Osteopetrosis is a rare generalized skeletal disorder characterized by increased density of bones accompanied by loss of their normal structure. The disease is more frequently seen in groups where consanquinity is common. As a rule, the severe forms are recessively inherited, whereas asymptomatic mild forms are transmitted as dominant traits. Males and females are equally affected by osteopetrosis (1).

In osteopetrosis the cortex and spongiosa of the bones have increased thickness and density, whereas the bone marrow spaces are reduced in volume. The bones are heavy, hard and easily fractured. The longitudinal growth of the tubular bones is usually retarded. Roentgenograms of the bones show increased density and lack of normal structure. The shadow of the marrow space is reduced or absent. One of the classical features of the disease is increased susceptibility to fractures even after a mild trauma. The long bones are the most frequently affected parts.

The base of the skull is markedly thickened and dense. The vertebral bodies show sclerosis along the edge of their upper and lower surfaces giving the "sandwich" like appearance on X-rays, or they are homogenously dense. Depending on the defective metaphyseal modelling, there is a generalized increase in the density of cortical bones giving a "bone in bone" appearance especially to long bones on skeletal roentgenograms. Fractures, deafness, visual impairment and bone marrow failure are other

features of the disease (1-3). Disorder of bone resorption is the result of failure of osteoclasts to resorb immature bone. Bony encroachment of the optic nerve at the level of optic foramina results in the compression of the nerve, which causes optic atrophy and blindness. Visual evoked potentials (VEP) can be performed in order to investigate optic nerve involvement. Hearing impairment is less common than visual impairment, and both occur mostly within the first year of life. Sclerosis of the ossicles in the middle ear and bony compression of the nerve are reported in the pathogenesis of the deafness (3).

Bone marrow failure leads to anemia, trombocytopenia and transfusion dependency. Children have the clinical features of anemia with compensatory erithropoietic hepatosplenomegaly. Since there is the chance for bone marrow transplantation, blood should be preserved for tissue typing before transfusion (3,4).

Patients are susceptible to recurrent infections because of anemia, poor nutritional status and defective leucocyte functions. There is a defect in the generation of superoxides by the leucocytes in the affected patients (5). Viral respiratory tract infections are the most common recurrent infections. Pneumonia and septicemia are the main causes of death. The rate of mortality is high especially within the first two years. The severity of illness depends on visual and hemathological problems seen within the first three months (3,5).

Bone marrow transplantation is the best treatment for osteopetrosis. Steroids, interferon and calcitriol are the other choices. Steroids are beneficial for the relief of hematological problems, not for a long time. Recipients may continue to have orthopaedic and dental problems. Osteoclastic activity can be evoked by parathormon and calcitriol. In some cases bone resorption can be demonstrated by giving high dose calcitriol (3,5,6).

Five year survival of cases receiving bone marrow from a HLA mismatched donor is 10% . This ratio increases up to 50-70% in recipients from HLA identical siblings. Moreover, the earlier the bone marrow transplantation, the less the neurosensorial defects. The median age for transplantation is 4 months (6).

In the series of Benichou and his colleagues, in France, the clinical and radiological manifestations of 42 patients with autosomal dominant osteopetrosis were reported. The main inclusion criterium in the study was the presence of vertebral endplate thickening which produces the "sandwich vertebra" appearance. The classic "bone in bone" appearance was present in most but not all skeletal sites. These typical appearances were also present in the roentgenograms of our case. Results of the series revealed that fractures were common (78%) and healed slowly. Hip osteoarthritis developed in 27% of patients and required arthroplasty in 9 of the 16 affected hips. 24% of the patients had thoracic or lumbar scoliosis. Cranial nerve involvement responsible for hearing loss, bilateral optic atrophy and facial palsy which are clearly attributable to osteopetrosis were present in only 6 cases (7). Frontal bossing, prognathism, recurrent infections, growth retardation and nistagmus were present, but hearing loss, visual impairment, fractures, osteoarthritis and /or scoliosis were not present in our case.

By presenting our accidental diagnosis of osteopetrosis, we wanted to make a review on this rare disease in the light of literature.

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