The bone scan in disseminated BCGitis

Abstract

Despite the long history of worldwide use of bacillus Calmette-Guerin (BCG) vaccine, a wide spectrum of adverse reactions has been observed in a small proportion of immunized infants. The most severe complication is disseminated BCGitis, often fatal but extremely rare and considered to be a result of host immunodeficiency. At present, polymerase chain reaction test, CT scan, ultrasound, X-rays and bone marrow aspirations are the investigations used to diagnose this disease. We report a case report of a 6 months old female infant with disseminated BCGitis. This paper aims to highlight the advantages of using bone ^{99m} Tc MDP imaging and its findings in supporting the diagnosis of disseminated BCGitis.

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Introduction

The original Bacille Calmette-Guerin (BCG) strain of mycobacterium (M) bovis is derived by multiple passages of the wild type M. bovis [1]. BCG vaccine is administered worldwide to prevent tuberculosis and is considered to have an excellent safety profile. Being live, BCG bacterial vaccine should not be administered to persons with immune system impairment [2, 3]. In such individuals BCG may disseminate from the injection site to multiple organs with fatal consequences [4-6]. There are few reports of disseminated BCG especially from Iran and Canada [7, 8] but in none of these reports bone scan was used for the diagnosis and evaluation of the extent of the disease.

This is the case report of a 6 months old female infant, who was diagnosed with disseminated BCGitis. The aim of this study was to present the role of bone scan imaging in the detection of this disease.

Description of the case

A 6 months old female infant, was presented to another Hospital because of fever, irritability and respiratory distress, since three weeks. She also developed an exanthematous oral lesion in the right bucal mucosa, and had a positive history of diarrhea and vomiting for a week. She was referred to Namazi Hospital, Iran, Shiraz with suspicion of pneumonia and meningitis.

The only notable past medical history was hyper bilirubinemia at day 4 after birth, treated by phototherapy for 3 days. Her parents were first cousins. The patient's brother had died the previous year at the age of 9 month with suspicion of pneumonia. Initial examination revealed fine crackles in the right lung and also tongue thrush. A course of penicillin and acetaminophen was prescribed.

X-rays of the skull showed a single lesion in the right side of the sagittal suture, which was suggestive of vascular compression. Abdominal ultrasound examination showed enlargement of the liver and spleen with normal homogeneous echo texture. Abdominal axial computerized tomography (CT) scan demonstrated mild hepatosplenomegaly. Chest X-rays showed moderate to severe pleural effusion in the right side and multiple lytic lesions at the level of different ribs. For whole body bone evaluation, bone scan was performed after the intravenous injection of 300 MBq technetium-99m methylen diphosphonate (^{99m}Tc-MDP) which revealed multiple active "hot" bone pathology in the skull, ribs, pelvic bones, both femors, tibia and upper limbs from humerus to fingers (Fig. 1). Regarding multiplicity of the bone lesions accompanied by other infectious signs, the scan pattern was highly suggestive of disseminated bone inflammation which could be osteomyelitis and considering the patient age and family history, immune deficiency disorders were possible.

For better evaluation, X-rays of the chest, the forearms (Fig. 2) and also the pelvis, and the femurs, showed multiple lytic lesions. Bone biopsy was performed and with respect to the bone scan report, the specimen was cultured and found positive for acid fast bacilli. BCG immunization as a routine national immunization program, had been applied on the first day of birth, therefore disseminated BCGitis was considered in the differential diagnosis. For documenting

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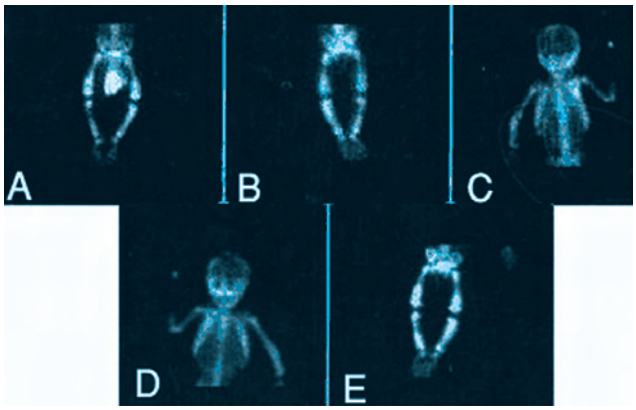

Figure 1. Whole body bone scan revealed multiple active bone lesions in the skull, ribs, pelvic bones, femors, tibiae and the upper limbs from humerus to the fingers.

this diagnosis, polymerase chain reaction (PCR) test was performed and was positive for M. bovis. Therefore, the diagnosis of disseminated BCGitis was made and anti-tuberculosis treatment commenced.

Despite medication, the patient's condition deteriorated. She developed hepatosplenomegaly with jaundice, aphthous oral lesions, maculopapular facial rash and papules on the abdomen. Full blood cells count revealed leucopenia (91% neutrophils) and anemia. Tests related to inflammation, namely ESR and CRP were significantly increased. The patient died 6 weeks after admission.

Discussion

Disseminated BCGitis in infants is a rare, yet fatal disease caused by BCG vaccination. Both local and systemic, BCG vaccine associated complications, occur [9]. It usually appears as a generalized lymphadenopathy, skin rash and hepatosplenomegaly [10]. Disseminated BCGitis appears as a result of impaired immune system of the host. Complications of BCG vaccination can be severe and life threatening in infants with immunodeficiency. Immunodeficiency is classified into primary and secondary. The commonest secondary immunodeficiency leading to disseminated BCGitis, is due to virus infection. However, considering parental consanguinity in this case and the brother's death at a similar age following an illness with similar clinical syndrome, there was high probability that our patient had primary immunodeficiency.

Some of the primary causes of immunodeficiency that predispose to disseminated BCGitis are: severe combined immunodeficiency with autosomal recessive pattern of inheritance, interferon γ receptor deficiency (IFNγR1 and IFNRγ2 deficiencies) and interleukin 12 deficiency [10-12].

The clinical presentation of disseminated BCGitis is not pathognomonic and the physician can be misled. For example, the occurrence of systemic manifestations, such as skin rash and hepatosplenomegaly, can closely mimic those of haematological malignancies. Positive PCR test for M. bovis, bone marrow aspiration and fine needle aspiration of lymph nodes involved, are the best methods to confirm the diagnosis

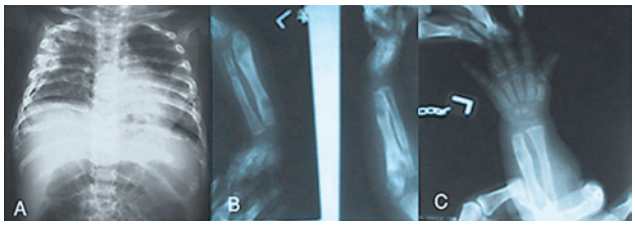

Figure 2. Chest X-rays (A) and left forearm X-rays (B, C) revealed multiple lytic lesions in the ribs and the forearm.

of disseminated BCGitis [11, 13].

There are no reports of the use of bone scintiscan in showing the extent of bone involvement in disseminated BCGitis. Bone scan is a fast diagnostic procedure that can early support the diagnosis of the disease. The bone scan image in our case was not indicative of metastatic disease because the lesions were mostly large and involved the peripheral bones.

In conclusion, disseminated BCGitis is a rare usually fatal adverse effect of BCG vaccination in infants with immunodeficiency. At present, CT scan, ultrasound, X-rays and bone marrow aspirations are the investigations used to diagnose this disease while definite diagnosis is made by tissue biopsy and culture. Bone scan may be helpful in diagnosing skeletal dissemination of BCGitis.

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