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Research article

Imaging analysis about four cases of AIDS complicated with bone infarction

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Abstract

Objective: To discuss the imaging features of AIDS patients complicated with bone infarction.
Method: Four AIDS patients complicated with moderate and advanced bone infarction were enrolled and their imaging data was analyzed retrospectively.
Results: Four patients were all involved with bilateral femoral inferior segment and proximal tibia. Irregular low-density shadow could be seen in the X-ray film, and there were trip or point flaky calcified shadows in the medullary cavity. CT examination showed that bone trabecular structure disappeared, and irregular calcification was visible with strip hardened edge around cancellous bone. MR imaging showed slightly hyperintense or isointense on T2WI images, and hypointense or isointense on T1WI images, and some double-hypointense also could be visible. Between the normal bone marrow and the edge, abnormally hyperintense, winding long T2 hyperintense and T1 hypointense could be visible via STIR sequences.
Conclusion: X-ray, CT and MRI were all favorable for diagnosis of AIDS patients complicated with moderate and advanced bone infarction, among which, by contrast, MRI seemed to be the most efficient imaging examination.

Keywords: AIDS; Bone infarction; Imaging features

1. Introduction

AIDS is a severe immunodeficiency infectious disease which is infected by human immunodeficiency virus. HIV mainly infects and destroys helper T lymphocytes (CD4T lymphocytes), leading to the cellar immune function defected, and finally complicated with all kinds of serious opportunistic infections and tumors [1]. HIV-related bone infarction, which can be a complication of AIDS patients, refers to diffuse or focal ischemic necrosis of bone cells and bone marrow cells occurred in diaphysis and metaphysic [2]. The imaging features of this disease were rarely reported in clinical practice and literature. For further understanding, we try to analyze the imaging features of four AIDS patients with bone infarction, and provide potential evidences for clinical diagnosis.

2. Materials and methods

2.1. General information

Four patients were enrolled, with 3 males and 1 female and with the age of 30–46 years old (mean age of 39 ± 1. 25). Three patients had a history of drug abuse for 5–20 years. Four patients were all suffered from systemic multiple bone infarctions. In each patient, both the bilateral femoral inferior segment and proximal tibia were involved for 10 months to 5 years. Moreover, three patients had histories of taking glucocorticoids over 5 months to 1 year, and one patient had a medical history of osteoarthritis. The four patients all underwent X-ray, CT and MRI examinations.

2.2. Imageological method

Bilateral knee AP & LAT were taken for X-ray examination using Neusoft Neustar DR, a routine scan of bilateral knee

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joint (axially of 5 mm) was employed for CT examination using Neuviz Dual double-row helical CT; and conventional coronal, sagittal and axial scans were carried out for MRI examination using the parameters as follow: FSE sequences for T_2WI with TE of 120/106 ms, TR of 4447 ms; SE sequences for T_1WI with TE of 10 ms, TR of 487 ms; and STIR sequences for fat suppression imaging with TE of 110 ms, TR of 6995ms. Scanning layer spacing was 4 mm, thickness of layer was 5. 2 mm (using machine: Neusoft superconducting MRI1. 5 T body coil).

3. Results

3.1. X-ray images

In the four cases of bone infarction, irregular low-density shadow was visible in the X-ray film, and there was a strip-like or point-like flaky sclerotic density shadow in the medullary cavity.

3.2. CT results

The manifestations of infarct lesions included trabecular bone destruction, trabecular bone structure disappearance (showed with frosted glass-like change), and irregular calcification. There were banded sclerotic margins around the cancellous bone in the serpiginous bone absorption region.

3.3. MRI results

The MR imaging of the 4 cases all showed typical and multiple map-like changes and the primary manifestations included slight hyperintense or isointense on T2WI images with partially visible spot-like higher hyperintense; primary isointense on T1WI images with partially spot-like slight hypointense; and double-hypointense on T1WI and T2WI images. Abnormal hyperintense, winding long T2 hyperintense and T1 hypointense presenting as map-like changes could be visible when comparing with the normal bone edge Figs. 1−4.

4. Discussion

4.1. Pathological findings of AIDS complicated with bone infarction

Bone infarction primarily occurs in the long bones, metaphysis and diaphysis of limbs, and it was usually multiple and symmetric, with rare of single [3]. Generally, there was no change of articular cartilage. The differences between HIV/AIDS-related bone infarction and non-HIV/AIDS related bone infarction included the following two aspects. In terms of pathogenesis, immune levels of HIV/AIDS patients' were low. The long history of drug abuse and drug injection resulted in long-term damage to the blood vessels, which lead to dearterialization of the osteocytes and marrow cells in the metaphysis or diaphysis, and thereby producing the corresponding pathologic changes including ischemia and necrosis.

4.2. Imaging findings of AIDS complicated with bone infarction

The primary imaging characteristics was closely related to the pathological progress. The basic pathological changes of bone infarction included two stages, i.e., the stage of necrocytosis (early stage), and the stage of bone regeneration (middle and advanced stages). In the early stage of bone infarction, the blood supply of bone tissue was disrupted, bone marrow edema occurred and osteocyte died gradually. Due to that the general structure of the bone tissue was not changed, the structure and density of sclerotin would not change as well. So that no obvious imaging findings were shown in X-ray and CT, however, MRI has a high sensitivity for detecting bone marrow edema, which presented hyperintense on T2WI images and hypointense on T1WI images. In the middle and advanced stage of bone infarction, there mainly occurred revascularization, absorption of sequestrum, neoplastic bone formation and so on. During this period, X-ray scanning showed that the density of local sclerotin decreased after bone destruction, and there was strip-like or point-like flaky sclerous density shadow in the medullary cavity. Via CT scanning, bone destruction was also obvious, sclerosis rim could be seen, trabecular bone structure disappeared (presented as frosted glass-like change) and sequestrum could be visible. As for MR imaging, it showed typical map-like changes with slight hyperintense or isointense on T2WI images, in which spot-like higher hyperintense was detected; isointense was shown on T1WI images, and spot-like slight hypointense could be seen as well; and participially double-hypointense occurred on T1WI and T2WI images, and abnormal hyperintense, winding long T2 hyperintense and T1 hypointense presenting as map-like changes could be visible through STIR sequences when compared with the normal sclerotin edge, with ‘double ring’ sign in some lesions. Generally, map-like changes were considered as the typical MR imaging manifestations of bone infarction, while ‘double ring’ sign was considered as the specific MR imaging finding [4].

4.3. Imaging features of bone infarction in non AIDS patients

Bone infarction was the most common in divers, also known as decompression sickness. In recent years, the non - diving bone infarction caused by other reasons has gradually increased [5]. According to Japan's large-scale epidemiological survey found that the use of corticosteroids and alcohol is the most important risk factor for bone infarction, about 90% of patients with. X-ray had no abnormal changes in early stage [6]. Qinghu Cai [7,8] find the X-ray of Bone infarction showed irregular sclerosis porphyritic shadow, string or scattered in the distribution, and a few meandering walking stripes calcifications, such as removal of necrotic and new bone has not yet formed, for the lower density areas or lobulated cystic lesions, marginal sclerosis, development is often mixed with patchy shadows of high density. CT scan in early stage of bone infarction was negative or osteoporosis [9,10]. In the middle of the bone infarction, the small changes of the insect bite and the spot calcification, which

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