

Imaging diagnosis

Case 355

4. Metastatic bone tumor

【Progress】

He was introduced to university hospital for further diagnosis and cutting-edge treatment.

【Discussion】

In clinical reality, three major diseases are acquired in municipal hospital: compression fracture, pyogenic spondylitis, and metastatic vertebra tumor. These diseases are based on fatty bone marrow in adults. The differentiation in MRI images is made by expansion of the lesion and information of diffusion weighted imaging (WI), and values of apparent diffusion coefficient (ADC).

Vertebrae in children is occupied by red bone marrow that filled with bone marrow cells inducing production of red blood cells, white blood cells and platelets. Red bone marrow composes of dense and small bone marrow cells sized around 10mm with least extracellular space (1-4), leading disorder of water molecules diffusion and lowering ADC values of around 0.5 (5-7). Red bone marrow transit to fat bone marrow as aging. Signal intensity of bone marrow on T1WI elevate from black to whitish as age advances, namely, fat bone marrow increases (2, 3). Regenerative bone marrow in adults can increase when they fall in anemia. In other words, regenerative bone marrow, namely red bone marrow increases in fatty bone marrow in patients with anemia indicates low signal intensity area appears in relatively high signal intensity of fatty bone marrow.

As ages advance, the incidence of compression bone fracture after stress burden increases on fatty bone marrow, especially in patients with osteoporosis.

Meanwhile, local fatty lesion in vertebrae is also encountered, indicating localized fatty bone marrow or hemangioma containing fatty tissue (4). The mixture of fatty and red bone marrow of vertebrae indicates inhomogeneous signal intensity on T2WI and T1WI (2, 3). Red bone marrow indicates low signal intensity on T1WI, T2WI and Diffusion WI because red bone marrow composes of dense accumulation of bone marrow cells of 10 micrometer and least extracellular space (1).

In our case, space occupying lesions (SOL) on Th2, Th3, Th4, Th8, and L1 are depicted on fat suppression T2WI and Diffusion WI. ADC values of SOL are 0.734 -0.994, indicative of lowering, namely disorder of water molecules diffusion. Although ADC values of abscess and malignant lymphoma can be less than 0.6, the lesion with 0.9 to 1.1 indicative of malignancy such as prostate cancer, digestive organ adenocarcinoma, and liver carcinoma of metastatic liver carcinoma, hepatocellular carcinoma, and cholangio-cellular carcinoma.

ADC values of red bone marrow and multiple myeloma are 0.456- 0.490 and 0.4662, respectively (7). ADC values of compression fracture are between 1.2 and 2.0. Meanwhile, ADC values of metastatic bone tumors are between 0.7 and 1.3 (7). ADC values of our case are contradictory with pyogenic spondylitis and benign compression fracture but compatible with metastatic bone tumors.

【Summary】

We presented an eighty-year-old male for intermittent left shoulder pain for approximately 6 months. Space occupying lesions are depicted on thoracic spine MRI. ADC values are 0.734-0.994 which are compatible with metastatic bone tumors. It is borne in mind that three main spine lesions in vertebrae: compression fracture, pyogenic spondylitis and metastatic bone tumors, are listed. The key for their differentiation is to check ADC values. ADC values of compression fracture are between 1.2 and 2.0 while, ADC values of metastatic bone tumors are between 0.7 and 1.3. ADC values of pyogenic spondylitis vary dependent upon the volume of abscess.

【References】

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