Brachial Plexus Involvement of Myeloid Sarcoma Detected by Reconstruction Magnetic Resonance Neurography

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Abstract

Myeloid sarcoma is a rare hematological disorder that presents as an extramedullary mass of immature myeloid precursors. We herein present the case of a 57-year-old man with a seven-month history of progressive weakness in the right upper extremity. Reconstruction magnetic resonance neurography showed a marked enlargement of the right brachial plexus. Fluorodeoxyglucose positron emission tomography revealed a radioactive lesion in the sacrum, in addition to the right brachial plexus, and a biopsy of the sacrum revealed myeloid sarcoma. The brachial plexus lesion was also regarded as myeloid sarcoma because of the treatment response. Isolated myeloid sarcoma involving the brachial plexus is very rare and its diagnosis is difficult as there was neither a history of leukemia nor bone marrow involvement in this patient. In this case, reconstructed magnetic resonance neurography was useful for detecting the brachial plexus mass lesion which led to an early diagnosis and good recovery.

Key words: myeloid sarcoma, magnetic resonance neurography, short inversion time inversion recovery, maximum intensity projection, brachial plexus

Introduction

Myeloid sarcoma is an extra-osseous and solid collection of myeloblasts. Although myeloid sarcoma occurs most often in association with acute myeloid leukemia (AML) or chronic myeloid leukemia (CML), it can also sometimes be seen as a harbinger of AML in non-leukemic patients (1). In such cases, the diagnosis of myeloid sarcoma is challenging. We herein report a rare case of myeloid sarcoma with brachial plexus extension, but without bone marrow involvement. Brachial plexus lesions and the changes that occur in them after the treatment are well described using magnetic resonance neurography (MRN) employing coronal short inversion time inversion recovery (STIR) with maximum intensity projection (MIP) images (2).

Case Report

A 57-year-old man presented with a seven-month history of progressive right upper extremity weakness associated with right hand numbness. He also had shooting pain radiating from his right arm to the axilla. His past medical history was significant only for bronchial asthma. His neurologic examination showed weakness as per the Medical Research Council scale in the following muscles of right upper extremity: infraspinatus 4, deltoid 4, biceps 2, triceps 3, wrist extensor 1, wrist flexor 1, abductor pollicis brevis 1, abductor digiti minimi 1, and finger extensor 1. The muscle strength of the right serratus anterior and supraspinatus was normal and there was no muscle weakness in any other extremities. There was a reduced sensation to pinprick in his right forearm and hyperalgesia in his right hand. Tendon reflexes were absent only in the right upper extremity and the plantar responses were flexor. Blood tests, including a com-
marked right-sided hypertrophy from the cervical root to the brachial plexus (Fig. 1A), and this finding led us to consider the possibility of a neoplastic disorder in the differential diagnosis. Fluorodeoxyglucose positron emission tomography/computed tomography (FDG-PET/CT) revealed radioactive lesions in the right brachial plexus and sacrum (Fig. 2A), with a maximum standardized uptake value (SUV) of 4.1 and 5.2, respectively. Lumbar magnetic resonance imaging (MRI) showed a mass lesion on the sacrum extending to the adjacent soft tissues (Fig. 2B, C). At this time, he had no lower back pain, weakness or sensory disturbance in the lower extremities. A CT-guided needle biopsy was performed at the site of the sacrum lesion, and a diagnosis of myeloid sarcoma was confirmed on histopathology. At the time of diagnosis, there were no leukemic changes observed in either the peripheral blood or bone marrow.

His treatment began with intrathecal chemotherapy (methotrexate, cytarabine, and dexamethasone) followed by induction chemotherapy (idarubicin and cytarabine) and two courses of consolidation chemotherapy (first, mitoxantrone and cytarabine; second, daunorubicin and cytarabine), and sequential allogenic bone marrow transplantation from an unrelated donor. Thereafter, the weakness and pain in the right upper extremity significantly improved, although the intrinsic muscle weakness and paresthesia of the right hand persisted. After chemotherapy, MRN showed a reduction in the nerve hypertrophy from the cervical root to the brachial plexus (Fig. 1B). Follow-up FDG-PET/CT examinations showed no abnormal FDG uptake in the right brachial plexus and a decreased FDG uptake in the sacrum (maximum SUV 1.9). At twenty months after diagnosis, the patient remains in remission and has not developed acute myeloid leukemia.

**Discussion**

In this case, radiological investigations revealed nerve hypertrophy of the right brachial plexus, a mass lesion in the

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**Figure 1.** The maximum intensity projection (MIP) images of short inversion time inversion recovery (STIR) sequences in the coronal plane revealed nerve hypertrophy from the right cervical root to the brachial plexus (A). Five months after starting the chemotherapy, the nerve hypertrophy improved (B).

**Figure 2.** An increased fluorodeoxyglucose uptake was seen in the right brachial plexus (black arrow heads) and sacrum (black arrows) in sagittal whole-body positron emission tomography/computed tomography (A). Lumbar magnetic resonance images (MRI) showed a lesion of slight hyper-intensity in the sacrum extending to the adjacent soft tissue on sagittal (white arrow heads) and axial (white arrows) T2-weighted images (B, C).
sacrum, and myeloid sarcoma on biopsy of the sacral lesion. The brachial plexus lesion was also regarded as myeloid sarcoma, because chemotherapy not only improved the neurological manifestations, but also resulted in the radiological improvement of the lesions both on MRI and FDG-PET/CT. The most common sites of involvement in myeloid sarcoma are the bone, periosteum, soft tissues, lymph node, and skin (1). Brachial plexus involvement in myeloid sarcoma is very rare and only a few cases have so far been previously reported (3-5). In patients with AML, nerve root involvement is commonly disseminated from the metastasis of leptomeninges. However, an autopsy case of brachial plexus involvement in myeloid sarcoma proved that nerve infiltration by blast cells was maximal at the enlarged segments of the nerves without spinal root infiltration (3). Considering this case and the remote multiple lesions observed in our case, it is assumed that the brachial plexus lesion was not longitudinally disseminated from leptomeninges via the spinal roots, but instead had originated from the hematogenous spread of blast cells. Although the pathogenesis of myeloid sarcoma is still not clear, a previous study suggested that the overexpression of cell adhesion molecules by blast cells may cause the development of myeloid sarcoma prior to the onset of bone marrow and blood abnormalities (6).

Myeloid sarcoma most frequently presents with AML, but it can rarely be identified as isolated myeloid sarcoma, as defined by the absence of any history of leukemia, myelodysplastic syndrome, myeloproliferative neoplasm, and a negative bone marrow biopsy. It is well known that delayed or inadequately treated myeloid sarcoma frequently progresses to AML (7), but current studies have shown that chemotherapy (combined with hematopoietic cell transplantation) can prevent this progression to AML (7). Therefore, an accurate diagnosis of isolated myeloid sarcoma and an early initiation of appropriate therapy are very important.

Recently, MRN has been increasingly used for the evaluation of patients with peripheral neuropathy. Although conventional MRI can also depict lesions in the peripheral nerves by the evaluation of several cross-sectional images, MRN with 3-dimensional reconstruction of STIR images can easily show morphological changes and the distribution of lesions from the cervical roots to the brachial plexus (2). In our case, this technique demonstrated marked nerve hypertrophy from the cervical roots to the brachial plexus on one side, and this finding led us to consider the possibility of neoplastic disease in the differential diagnosis. Follow-up MRN after treatment also enabled us to evaluate the treatment response of this lesion.

Although brachial plexus involvement in isolated myeloid sarcoma is very rare, it should not be overlooked to prevent such patients from progressing to AML. MRN employing STIR MIP images is thus considered to be useful for the diagnosis of myeloid sarcoma and evaluating the treatment response.

The authors state that they have no Conflict of Interest (COI).

References