Spinal Epidural Granulocytic Sarcoma in a Child Precedent to Clinical Manifestation of Acute Myeloid Lymphoma
—Case Report—

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Abstract

A 13-year-old boy presented with an epidural thoracic granulocytic sarcoma manifesting as rapidly progressive paraplegia preceding clinical manifestation of acute myeloid leukemia (AML). Magnetic resonance imaging revealed a thoracic epidural tumor. He underwent emergent laminectomy and the tumor was totally resected. The initial histological diagnosis was malignant lymphoma. The correct diagnosis of epidural granulocytic sarcoma and AML was established based on cell-surface markers and a chromosomal study of the bone marrow cells. A combination of chemotherapy and bone marrow transfusion achieved complete remission of leukemia. No evidence of AML has emerged over the 18-month follow-up period. Granulocytic sarcoma should be considered in the differential diagnosis of an epidural mass in pediatric patients with or without acute leukemia. Immediate diagnosis and appropriate treatment are recommended to prevent leukemic transformation.

Key words: granulocytic sarcoma, pediatric patient, leukemia, spine

Introduction

Granulocytic sarcoma is a rare malignant neoplasm of primitive myeloid cell origin, most commonly found in association with acute myeloid leukemia (AML), with a reported incidence of 1.1–9.1% in patients with AML. The histological diagnosis of granulocytic sarcoma can be difficult before the manifestation of AML, and 47% of granulocytic sarcomas are initially misdiagnosed, mostly as malignant lymphoma, but also as neuroblastoma, rhabdomyosarcoma, Ewing sarcoma, or peripheral neuroectodermal tumor. Granulocytic sarcomas generally occur in the soft tissues, bone, and skin, whereas the spinal column is much less commonly involved, with an incidence of 13% to 19%. The thoracic spine is the most common site (64%) followed by the lumbar (29%), sacral (20%), and cervical (5%) spine. Occasionally, the tumor may antedate the clinical manifestation of leukemia. Involvement of the central nervous system is rare as a first manifestation of granulocytic sarcoma, and spinal cord compression is even rarer.

Establishment of definitive diagnosis of granulocytic sarcoma is one of the important steps in the treatment of AML, because protocols for leukemia are different from those for lymphoma. Granulocytic sarcomas are classically known as chloromas because of the greenish color of fresh specimens. However, the nomenclature of granulocytic sarcoma, proposed in 1967, has recently become widely accepted, because up to 30% of these tumors are white, gray, or brown rather than green.

Here we describe a pediatric case of thoracic epidural granulocytic sarcoma manifesting as paraparesis before the diagnosis of AML, which was successfully treated by intensive chemotherapy and bone marrow transfusion, finally resulting in complete remission of leukemia.

Case Report

A 13-year-old otherwise healthy boy consulted a medical practitioner with complaints of acute onset of progressive exophthalmos persisting for a few days. Magnetic resonance (MR) imaging of the brain revealed multiple tumors in the left temporal lobe and left orbit. About 2 days later, the patient suffered back pain and could not lie down as a result. On the
Fig. 1 A: Sagittal T2-weighted magnetic resonance (MR) image showing a solid mass (arrow) as an epidural mass at the T4–T6 levels. B: Sagittal T1-weighted MR image with fat suppression and contrast medium showing a solid mass (arrow) with homogeneous enhancement. C: Axial T1-weighted MR image with fat suppression and contrast medium showing a solid mass (arrow) compressing spinal cord.

Fig. 2 A: Sagittal T1-weighted magnetic resonance (MR) image of the lumbosacral spine with fat suppression and contrast medium showing multiple solid masses (arrows) on the anterior aspect of the sacral vertebra. B: Axial T1-weighted MR image of the brain showing intraorbital and intramuscular solid masses (arrows).

Fig. 3 A: Photomicrograph showing a population of immature cells with round to oval nuclei and fine chromatin. Hematoxylin and eosin stain, original magnification ×400. B: Photomicrograph of bone marrow cells demonstrating large and irregular shaped nuclei (arrow), with Auer bodies in some cells (arrowhead). May-Giemsa stain, original magnification ×400. C: Photomicrograph of granular leukocytes in the bone marrow (arrows) with positive staining for myeloperoxidase. Myeloperoxidase stain, original magnification ×400.

referral day to Hiroshima University Hospital, he suffered acute onset of paraparesis and was immediately admitted.

Physical examination revealed grade 4 paraparesis of the lower extremities, and increased deep tendon reflexes in the lower extremities. He denied bowel or bladder incontinence. Exophthalmos was also observed on the left. White blood cell count was 13370/μl, hemoglobin level was 13.6 g/dl, and platelet count was 143000 cells/μl. MR imaging of the spine confirmed multiple epidural mass lesions: one lesion extending from T5 to T6, and another lesion located on the anterior aspect of the L5 and sacral vertebrae (Figs. 1 and 2).

Intravenous methylprednisolone (30 mg/kg) was administered on the day of admission. The next day, the patient underwent laminectomy from T4 to T6, and the thoracic mass lesion was totally resected. Intraoperative inspection revealed a rubbery hard and reddish tumor in the epidural space compressing the dural sac. The tumor was slightly adherent to the dural sac but was easily dissected and completely removed. The dural sac was intact. Bone-marrow aspiration was performed simultaneously by pediatricians.

Histological examination of the spinal mass lesion demonstrated atypical neoplastic cells with proliferation of the small round to oval and hyperchromatic nuclei in a diffuse pattern (Fig. 3A), suggesting the possibility of malignant lymphoma. Immunohistochemical studies of bone marrow cells revealed positive staining for myeloperoxidase, CD13, CD33, CD34, CD45, and CD56, almost all of which are markers for myeloid-lineage cells (Fig. 3C). A number of cells included Auer bodies (Fig. 3B). Chromosomal analysis yielded a t(8;21) translation. Approximately one month after the operation, the final diagnosis of myeloblastic leukemia with maturation (AML-M2) and granulocytic sarcoma was estab-
lished.

Despite induction chemotherapy for AML-M2, the patient did not achieve complete remission. A combination of intensification chemotherapy with five courses and bone marrow transplantation finally resulted in complete remission of leukemia and disappearance of the spinal mass lesions. The patient made a complete recovery from the paraplegia. No evidence of AML has emerged over the 18-months follow-up period.

Discussion

Only 10 cases of spinal granulocytic sarcomas in pediatric nonleukemic patients have been reported, including the present case (Table 1).7,8,12,13,16,21,23–25) Nine of the 10 patients were males, and the mean age was 11 years. The male predominance might be associated with the higher incidence of AML in males.6) The affected sites included 8 cases in the thoracic and 2 in the lumbar spine. All patients suffered motor disturbance and half had back pain. Five patients finally diagnosed as AML, and 4 of these 5 patients died within a relatively short time (mean 11 months).8,13,24,25) On the other hand, among the 5 patients who did not develop AML, only one patient died.23) Retrospectively, our patient showed the typical manifestation of pediatric spinal epidural granulocytic sarcoma preceding clinical manifestation of leukemia. However, intensive treatment was performed before the manifestation of leukemia, and our patient continued to do well after more than 18 months.

Space-occupying lesions in the spinal canal manifesting as symptoms suggesting spinal cord compression require adequate and timely treatment. A short course of high-dose methylprednisolone treatment, which is effective for acute spinal cord injury, may reduce the tumor size and decrease the number of blast cells in the peripheral blood and bone marrow.2,11) In the present case, methylprednisolone therapy performed on the day before the operation reduced the exophthalmos and improved the paraparesis. These findings suggest that methylprednisolone therapy results in tumor reduction, but the intraoperative findings of considerable size of the residual tumor in the present case indicate that surgical intervention remains essential for spinal cord compressive lesions with spinal cord involvement. The previous cases have also indicated the necessity for surgical decompression except in one patient.

In the present case, remission was induced by consecutive chemotherapy intended for AML and bone marrow transfusion. AML-M2 has a comparatively good prognosis and the remission rate is 96.4%, but the 4-year event-free survival rate is only 45.1%.19) Therefore, AML-M2 patients require close follow up, even after remission. The vast majority of nonleukemic patients with granulocytic sarcomas develop acute leukemia within a matter of months (mean 10.5 months).18) At the same time, the chemotherapy intended for AML prolongs the nonleukemic and the survival periods in patients with granulocytic sarcoma but without leukemia.8,9,26) Therefore, prompt diagnosis and adequate treatment, including surgery, are essential to achieving good outcomes, although pediatric granulocytic sarcoma is rare as an initial symptom of spinal compression.

The present case of granulocytic sarcoma in the thoracic epidural region manifesting as symptoms of spinal cord compression illustrates the difficulties in the diagnosis of granulocytic sarcoma without

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Age (yrs)/Sex</th>
<th>Spinal level</th>
<th>Initial manifestation</th>
<th>Treatment</th>
<th>Finally diagnosed as AML</th>
<th>Outcome (mos)</th>
</tr>
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<tbody>
<tr>
<td>Wilhyde et al. (1963)</td>
<td>12/F</td>
<td>T3–T11</td>
<td>back</td>
<td>+ +</td>
<td>SD, R</td>
<td>yes</td>
</tr>
<tr>
<td>Chan et al. (1986)</td>
<td>13/M</td>
<td>T12–L1</td>
<td>–</td>
<td>+</td>
<td>SD, R</td>
<td>no</td>
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<tr>
<td>Wodzinski et al. (1988)</td>
<td>14/M</td>
<td>T3–T5</td>
<td>–</td>
<td>–</td>
<td>SD, Che</td>
<td>yes</td>
</tr>
<tr>
<td>Kook et al. (1992)</td>
<td>10/M</td>
<td>T5</td>
<td>–</td>
<td>+</td>
<td>SD, Che, R</td>
<td>yes</td>
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<tr>
<td>Deme et al. (1997)</td>
<td>15/M</td>
<td>L2</td>
<td>thighb</td>
<td>–</td>
<td>SD, Che</td>
<td>yes</td>
</tr>
<tr>
<td>Ugras et al. (2001)</td>
<td>13/M</td>
<td>T11–L1</td>
<td>back</td>
<td>+</td>
<td>SD</td>
<td>no</td>
</tr>
<tr>
<td>Howell and Abramowski (2005)</td>
<td>11/M</td>
<td>T1–T5</td>
<td>back</td>
<td>–</td>
<td>SD, Che</td>
<td>no</td>
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<tr>
<td>Meltzer and Jabinski (2005)</td>
<td>10/M</td>
<td>T2–T6</td>
<td>back</td>
<td>+</td>
<td>SD, Che</td>
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<tr>
<td>Shiozawa et al. (2005)</td>
<td>2/M</td>
<td>below L3</td>
<td>–</td>
<td>+</td>
<td>Che, R</td>
<td>no</td>
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<tr>
<td>Present case</td>
<td>13/M</td>
<td>T4–T6</td>
<td>back</td>
<td>+</td>
<td>SD, Che, BT</td>
<td>yes</td>
</tr>
</tbody>
</table>

AML: acute myeloid leukemia, BT: bone marrow transplantation, Che: chemotherapy, ND: not described, PBSCT: peripheral blood stem cell transplantation, R: radiation, SD: surgical decompression.
leukemic symptoms. Granulocytic sarcoma should be considered in the differential diagnosis of an epidural tumor with cord compression in pediatric patients, regardless of the evidence for leukemia.

References


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Neurol Med Chir (Tokyo) 49, May, 2009