Acute Lymphocytic Leukemia Recurring in the Spinal Epidural Space

—Case Report—

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Abstract

A 27-year-old man presented with a very rare spinal epidural mass associated with recurrence of acute lymphocytic leukemia (ALL) manifesting as acute progressive neurological deficits. The patient presented with shoulder pain and ambulatory difficulties 3 years after remission of ALL treated by bone marrow transplantation. Magnetic resonance imaging revealed an epidural mass extending from C-7 to T-3, which compressed the cord and extended to the intervertebral foramen along the roots. After decompression surgery, the symptoms dramatically improved. Histological examination showed clusters of immature lymphocytes consistent with recurrence of leukemia, so chemotherapy and radiation therapy were carried out. At 1 year after the operation, no local mass expansion or systemic progression of leukemia had occurred. Leukemic mass must be considered in the differential diagnosis of spinal epidural mass, even in patients with ALL.

Key words: lymphocytic leukemia, recurrence, epidural space, spine, cord compression

Introduction

Extramedullary tumors consisting of lymphoid or myeloid blasts outside the bone marrow occur in 3.1–9.1% of patients with leukemia.2,7) Such chloromas or granulocytic sarcomas, named for the color and histological characteristics, usually occur in patients with acute myelogenous leukemia (AML) and more frequently in children, with 60% of patients under the age of 15 years.2) Such extramedullary tumors are rarely reported in patients with acute lymphocytic leukemia (ALL), although ALL accounts for 80% of leukemia in children.8) Certain chromosome abnormalities, morphological subtypes, and expression of surface markers exclusively seen in patients with AML are associated with formation of leukemic mass.8,11) Extramedullary tumors are usually followed by evidence of leukemia in the peripheral blood or bone marrow. Only 0.65% of patients with AML undergoing bone marrow transplantation developed isolated extramedullary recurrence, followed by bone marrow relapses within 1 year in 95% of cases.4) The most common site was bone (including the cranium, sacrum, sternum, ribs, and spine), followed by soft tissue, skin, and lymph nodes.2,10) Spinal epidural tumors were found in only two of 1000 patients including cases of AML.11) Therefore, spinal epidural tumors are very rare in patients with ALL.

We treated a male patient with recurrence of ALL who presented with a mass in the spinal epidural space.

Case Report

A 27-year-old man presented with a 1-week history of bilateral lower limb numbness and weakness followed by progressive ambulatory difficulties, as well as a 1-month history of thoracic back pain radiating mainly to the right shoulder. He had a history of ALL (B cell type) at the age of 21 years which had gone into remission after four courses of systemic chemotherapy, but recurred at the age of 23 years. After several courses of further systemic chemotherapy, he received allogenic bone marrow transplantation, and had been in complete remission for 3 years and was followed up at the outpatient clinic. He had no signs of recurrence and had not
taken any medication for leukemia since remission.

On admission, neurological examination revealed spastic paraparesis grade 4/5, hyperreflexia in both ankles and knee jerks, and bilateral positive Babinski signs. Sensation was impaired below the T-4 level in all modalities. He was unable to walk independently. No apparent dysuria or dyschezia were noted. Laboratory work-up showed no abnormalities in blood cell counts, serum, urine, and cerebrospinal fluid analyses.

Magnetic resonance imaging demonstrated an epidural mass lesion extending from C-7 to T-3, causing spinal cord compression. The lesion was located mainly in the posterior epidural space and extended to the intervertebral foramen. The lesion appeared slightly hyperintense on the T2-weighted image and exhibited almost homogeneous enhancement after gadolinium injection. No abnormal findings were found in the spinal bone marrow (Fig. 1). Radiography and computed tomography showed no bone destructive lesions. [18F]fluorodeoxyglucose positron emission tomography (FDG-PET) showed a high uptake lesion consistent with the extradural mass (Fig. 2).

Twelve days after his admission, decompression surgery via a C7–T3 laminectomy and partial removal of the epidural mass were performed because of his acutely progressive neurological deficits. The soft gray mass was located only in the epidural space, and was easily dissected from the dura mater. However, we did not attempt to forcibly remove some parts of the mass, which extended to the anterior epidural space and intervertebral foramen.

Muscle strength remarkably improved within a few days, but some sensory disturbance of distal parts of the lower extremities persisted even 1 year after surgery. The patient's gait gradually became stable with intense rehabilitation. Histological examination revealed a cluster of immature lymphocytes and immunohistochemical analysis showed these lymphoid cells were CD20 positive, which were consistent with the diagnosis of recurrence of
Table 1 Summary of patients with extramedullary mass associated with acute lymphocytic leukemia (ALL) in the spinal epidural space

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Age (yrs)/Sex</th>
<th>Past history of leukemia</th>
<th>Diagnosis</th>
<th>Site of lesion</th>
<th>Symptoms</th>
<th>Treatment</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krepler et al. (1975)</td>
<td>11/F*</td>
<td>+</td>
<td>large cell ALL</td>
<td>T-9</td>
<td>paraplegia, back pain, neurogenic bladder</td>
<td>surgery, chemotherapy, radiation</td>
<td>survived &gt; 7 yrs</td>
</tr>
<tr>
<td>Lo et al. (1985)</td>
<td>3/M</td>
<td>+</td>
<td>null ALL</td>
<td>L2-4</td>
<td>paraparesis, back and leg pain, neurogenic bladder</td>
<td>chemotherapy, radiation</td>
<td>died at 4 mos</td>
</tr>
<tr>
<td>Pui et al. (1985)</td>
<td>15/M*</td>
<td>-</td>
<td>B cell ALL</td>
<td>T4-10</td>
<td>paraparesis, numbness below T-6, neurogenic bladder</td>
<td>chemotherapy, radiation</td>
<td>survived &gt; 6.6 yrs</td>
</tr>
<tr>
<td></td>
<td>3/M</td>
<td>-</td>
<td>pre-B cell ALL</td>
<td>T3-6</td>
<td>paraplegia</td>
<td>chemotherapy, radiation</td>
<td>survived &gt; 11 mos</td>
</tr>
<tr>
<td></td>
<td>11/M</td>
<td>-</td>
<td>T cell ALL</td>
<td>T2-6</td>
<td>paraparesis, numbness below T-2, neurogenic bladder</td>
<td>chemotherapy, radiation</td>
<td>survived &gt; 2 mos</td>
</tr>
<tr>
<td></td>
<td>9/F</td>
<td>-</td>
<td>common ALL</td>
<td>L2-3</td>
<td>paraparesis, neurogenic bladder, numbness below C-7</td>
<td>chemotherapy, radiation, surgery</td>
<td>died at 8 mos</td>
</tr>
<tr>
<td></td>
<td>8/M</td>
<td>-</td>
<td>B cell ALL</td>
<td>C5–T1</td>
<td>paraparesis, numbness below C-7</td>
<td>chemotherapy, radiation, surgery</td>
<td>died at 5 mos</td>
</tr>
<tr>
<td>Williams et al. (1990)</td>
<td>10/M*</td>
<td>+</td>
<td>common ALL</td>
<td>T-4</td>
<td>back pain</td>
<td>chemotherapy, radiation, bone marrow transplant</td>
<td>survived &gt; 2.5 yrs</td>
</tr>
<tr>
<td></td>
<td>11/M*</td>
<td>+</td>
<td>common ALL</td>
<td>L-4</td>
<td>sacral pain</td>
<td>chemotherapy, radiation</td>
<td>died at 2 yrs</td>
</tr>
<tr>
<td>Kataoka et al. (1995)</td>
<td>11/F</td>
<td>-</td>
<td>common ALL</td>
<td>T2-5</td>
<td>paraparesis</td>
<td>chemotherapy, radiation</td>
<td>survived &gt; 3 yrs</td>
</tr>
<tr>
<td>Mostafavi et al. (2000)</td>
<td>14/M</td>
<td>-</td>
<td>ALL</td>
<td>T10–L1</td>
<td>paraplegia, low back pain, neurogenic bladder</td>
<td>chemotherapy, radiation</td>
<td>died at 9 mos</td>
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<tr>
<td>Buyukavci et al. (2003)</td>
<td>6/F</td>
<td>-</td>
<td>Burkitt ALL</td>
<td>T9–10</td>
<td>paraparesis, back pain</td>
<td>chemotherapy, radiation</td>
<td>not stated</td>
</tr>
<tr>
<td>Present case</td>
<td>27/M*</td>
<td>+</td>
<td>B cell ALL</td>
<td>C6–T3</td>
<td>paraparesis, back pain</td>
<td>chemotherapy, radiation</td>
<td>survived &gt; 10 mos</td>
</tr>
</tbody>
</table>

*No other evidence of leukemia at diagnosis of epidural tumor.

B cell type ALL (Fig. 3). During the perioperative course, laboratory findings did not indicate any hematological disorder. Even bone marrow aspiration revealed no increase in blast cells or other abnormal findings. After the recurrence of leukemia was confirmed, the patient received 24 Gy of radiation therapy around the remaining tumor, followed by two courses of systemic chemotherapy using methotrexate and cytosine arabinoside. One year after the operation, no local mass expansion or systemic progression of leukemia was detected (Fig. 4).

**Discussion**

Twelve cases of spinal epidural tumors in patients with ALL have been reported since 1975 (Table 1).5–7,9,12 The accurate diagnosis of lymphoid leukemia could not be confirmed before that date. In the present case, FDG-PET imaging of the spinal epidural leukemic mass showed high uptake, suggesting the neoplastic lesion. Such new imaging methods could be useful for differential diagnosis. The age distribution of all 13 patients ranged from 3 to 27 years (median 11 years, mean 10.7 years). Only our patient was aged above 20 years. Nine patients were male and four were female. Five patients revealed the tumor without other evidence of leukemia with a diagnosis of spinal epidural tumor. Five patients had a past history of leukemia. Although the mechanism of mass formation without systemic leukemia has not been clarified, the origin of the mass is thought to be the bone marrow. Small amount of leukemic cells can migrate to the spinal
Fig. 4 Sagittal (left) and axial (right) T1-weighted magnetic resonance images with gadolinium showing the diminished mass 9 months after surgery, chemotherapy, and radiation therapy.

epidural space directly through haversian canals of the vertebral bone or hematogenously via epidural venous plexus, followed by forming the mass even before systemic leukemia.

The most common location of spinal leukemic mass is the thoracic region (73%), followed by the lumbar (34%), sacral (23%), and cervical (5%) regions. In our review of 13 cases, the spinal epidural mass was exclusively located at the thoracic region in seven patients. B cell subtype is more likely to cause cord compression than the T cell subtype. Only one of the 13 cases was the T cell subtype. The patients presented with various clinical manifestations. Motor disturbances resulting from cord compression were seen in 11 patients. Pain was seen in seven patients, two of whom exclusively complained of pain. Six patients had neurogenic bladder.

Treatment options included surgery, chemotherapy, and radiation therapy. Most patients were treated with a combination of chemotherapy and radiation, but surgery was performed in only five. Leukemic mass is usually sensitive to chemotherapy and radiation, so surgical decompression is only recommended for patients with acute spinal compression causing rapidly progressive neurological deficits. No factors including age, site, subtype, and occurrence pattern of leukemia are clearly related to the prognosis. All patients with long survival received early systemic chemotherapy followed by complete remission, so stereotactic needle biopsy or open biopsy is essential to confirm the early diagnosis.

Physicians should consider epidural leukemic mass in the differential diagnosis of spinal symptoms, especially in leukemic patients, because early diagnosis and treatment may exclude the need for surgery and obtain a greater chance of remission and long survival.

References


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