

Central Nervous System Involvement of Acute Lymphoblastic Leukemia

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Central nervous system(CNS) involvement of acute lymphoblastic leukemia may occur. However, CNS involvement as a first manifestation of leukemia is very rare. An 8-year-old girl complained of a backache after playing in the water. Neurological examination detected progressing paraparesis. Magnetic resonance imaging(MRI) of the thoracolumbar spine showed a well-circumscribed homogeneous posterior extradural mass lesion extending from T7 to T9. MRI of the brain showed diffused fatty marrow replacement of the calvarium and the skull base. We report a patient with epidural Burkitt's lymphoma of the thoracic and lumbar vertebra causing compression of the spinal cord after pathologic evaluation. The tumor consisted mainly of lymphoblastic cells, which were identical to those originally seen in the bone marrow aspiration and biopsy. After decompressive laminectomy she began consolidation chemotherapy.

KEY WORDS : Leukemia · Burkitt's lymphoma · Spine · Laminectomy.

Introduction

Burkitt's lymphoma and acute lymphoblastic leukemia (ALL)-L3 in French-American-British(FAB) classification are considered to be different forms of the same disease (B-cell disease)^{3,4}. Tumor cells have similar cytological and immunological features and display the same non-random translocation involving c-myc on chromosome 8q24 and the gene of an immunoglobulin chain on chromosome 14, 2, or 22⁵.

Involvement of abdominal viscera is a common presenting feature in Burkitt's lymphoma. Burkitt's lymphoma is also common in the head and neck, but it can be seen in other areas. Burkitt's lymphoma generally presents with a large tumor burden and disseminates early, especially in the CNS¹¹.

We present here one patient with paraparesis affected by Burkitt's lymphoma.

Case Report

History and examination

An 8-year-old girl came to our out-patient department in August 2005 with a history of backaches, headaches and lower extremity weakness after playing in the water. Three weeks

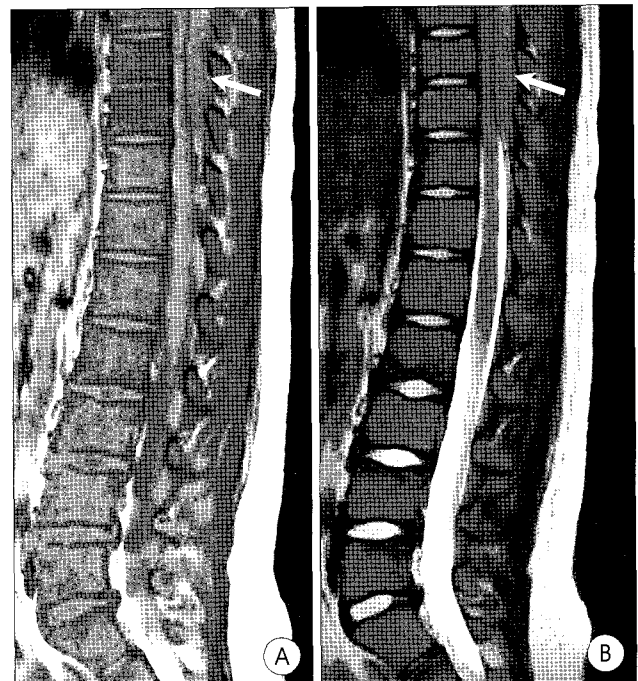


Fig. 1. Spin echo T1-weighted(A) and turbo spin echo T2-weighted(B) sagittal magnetic resonance images of thoracolumbar spine show a well-circumscribed homogeneous posterior epidural mass lesion with intermediate signal intensity extending from T7 to T9. The spinal cord is significantly compressed by this mass lesion.

• Received : November 14, 2005 • Accepted : February 15, 2006

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before her hospital visit, her back was hit by waterfall. On admission of neurological examination, paraparesis of motor grade IV and mid-thoracic area numbness was detected. But any other neurological deficit was not found.

A MRI of the thoracolumbar spine showed a well-circumscribed homogeneous posterior extradural mass lesion extending

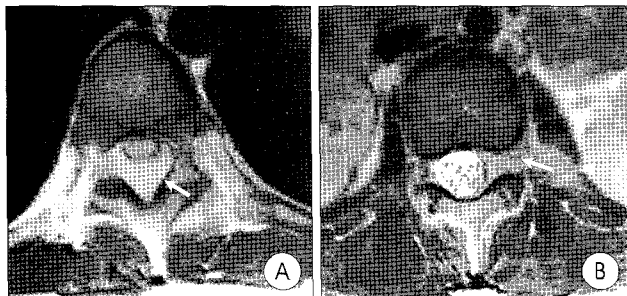


Fig. 2. A : Spin echo T1-weighted axial magnetic resonance(MR) image at T9 level shows a well-circumscribed homogeneous posterior epidural mass lesion with intermediate signal intensity which causes anterior displacement and compression of spinal cord. B : Turbo spin echo T2-weighted MR axial image at L2 level shows a well-circumscribed homogeneous left epidural mass lesion with intermediate signal intensity which causes mild indentation of spinal dural sac.

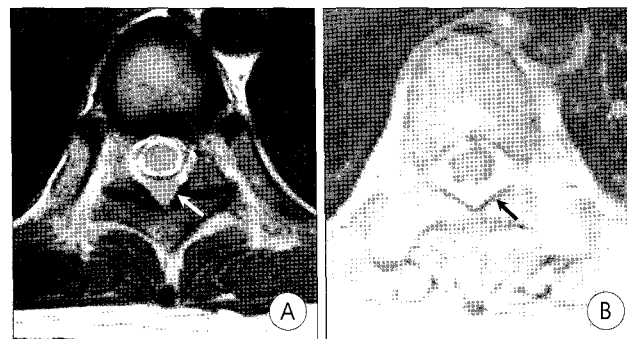


Fig. 3. Magnetic resonance(MR) images obtained 5 days after initial thoracolumbar MR image study. A : Turbo spin echo T2-weighted axial MR image at T8-9 disc level shows the volume of the posterior epidural mass lesion to have decreased significantly. B : Contrast-enhanced fat suppression T1-weighted axial MR image at the T9 body level shows a heterogeneous enhancement of the posterior epidural mass lesion.

from T7 to T9 (Fig. 1). This mass lesion was isointense relative to the spinal cord on T1- and T2-weighted images. The spinal cord was compressed and displaced anteriorly due to the posterior epidural mass lesion. At the L2 level, another mass lesion with similar signal intensities was seen in the left epidural space (Fig. 2). Thoracolumbar vertebral bodies and posterior elements showed diffused fatty marrow replacement on all pulse sequences. Contrast-enhanced T1-weighted images obtained five days later showed the epidural mass lesions revealed strong heterogeneous enhancement and their volumes were decreased (Fig. 3). The thoracolumbar spine showed multiple foci of irregular and geographic enhancement on a postcontrast MRI. MRI of the brain obtained one week later showed diffused fatty marrow replacement of the calvarium and the skull base that were enhanced homogeneously after intravenous administration of contrast media. Diffused meningeal thickening with lobulating contour and strong homogeneous enhancement were seen along the posterior surface of bilateral parietooccipital lobes. No parenchymal involvement was seen (Fig. 4).

Operation and Pathologic findings

We performed T8, T9 partial hemilaminectomy, and epidural mass removal. The mass was grossly yellowish-grayish and soft, fragile enough to suck out. It was hypovascular in nature and did not severely compress the dural sac. Frozen section diagnosis indicated a small round cell tumor including malignant lymphoma, leukemic infiltration, and Ewing's sarcoma. We decided not to remove other epidural masses of lumbar vertebra and to perform a bone marrow biopsy and aspiration intraoperatively. The permanent biopsy result was Burkitt's lymphoma, and the bone marrow biopsy result was ALL-L3. Regarding bone marrow aspiration and biopsy, lymphoblasts occupied 92.2% of the bone marrow cells, and normal marrow erythropoietic cells were almost replaced by leukemic cells. The tumor has a high rate of spontaneous cell death as well as a high proliferation rate, so it showed many apoptotic bodies¹⁰.

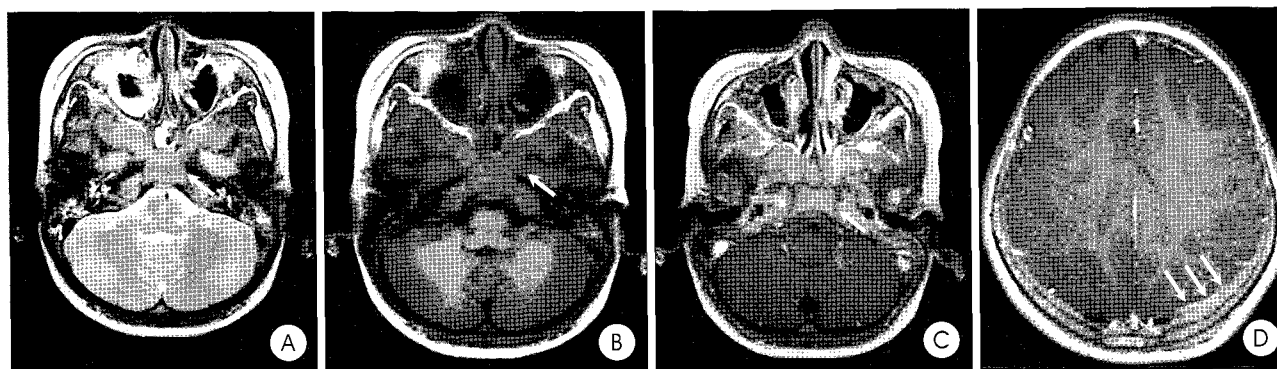


Fig. 4. Turbo spin echo T2-weighted (A) and inversion recovery T1-weighted (B) axial magnetic resonance images show diffuse fatty marrow replacement in the skull base and calvarium. Contrast-enhanced axial inversion recovery T1-weighted images at the level of medulla oblongata (C) and centrum semiovale (D) show diffuse homogeneous enhancement in the marrow cavity of skull base and diffuse dural thickening with enhancement on the posterior surface of both parietooccipital regions.

Post operative course

Post-operatively, lower extremity motor weakness improved to a nearly normal status. Her backaches also subsided. Because of the impression of leukemia, additional laboratory tests were performed including chromosomal study. For chemotherapy, she was transferred to the department of pediatric oncology and intensive polychemotherapy for a short-term regimen that began immediately². Now she is on consolidation chemotherapy.

Discussion

Burkitt's lymphoma was described in India as early as 1967⁷. It is the most frequent B-cell non-Hodgkin's lymphoma (NHL) in children but is rare in Korea^{4,6,9}. So far, there is no published case report about epidural Burkitt's lymphoma with bone marrow involvement in Korea. ALL-L3 in FAB classification is another face of the same disease^{3,4}. If bone marrow involvement is less than 25%, then the tumor is Burkitt lymphoma¹⁴. In Burkitt leukemia, bone marrow lymphoblasts are more than 25%, according to World Health Organization classification¹. Lymphoblasts are characterized by similar cytological features, by the presence of B-cell markers, especially CD20, monoclonal immunoglobulins on their surface, and specific translocations⁷. The disease is also characterized by a high proliferation rate and short cell cycle time, a great propensity to spread out and invade the CNS, and early relapses⁴.

There are clinical differences between 'endemic' forms encountered in sub-Saharan Africa (younger median age, frequent facial involvement, and paraplegia) and 'non-endemic' forms (predominance of abdominal tumors and frequent bone marrow involvement)^{8,15}. However, it is not clear whether the clinical differences correlate with different prognoses. The recognized prognostic factors that reflect tumor burden are : stage, lactate dehydrogenase level, bone marrow, and CNS involvement¹².

In our case, preoperative peripheral blood was counted as Hb 10.0, WBC 3,530 and platelet 141,000 and showed a few normoblast cells on the smear. There was no evidence of hematopoietic malignancy at that time. Therefore bone marrow aspiration and biopsy were not considered. We could not rule out post-traumatic epidural hematoma because of her trauma history, so we decided to operate on the lesions for the purpose of decompression and biopsy. Retrospectively, the leukemic phase of primary Burkitt's lymphoma is a more proper hypothesis¹.

Treatment of Burkitt's lymphoma is an oncological emergency. It requires prompt diagnosis and staging before treatment is initiated². Associated problems such as airway obstruction by a huge naso-pharyngeal tumor, infection, post-surgical complications, or metabolic problems, must be recognized and adequately treated. Chemotherapy appeared to be the key to

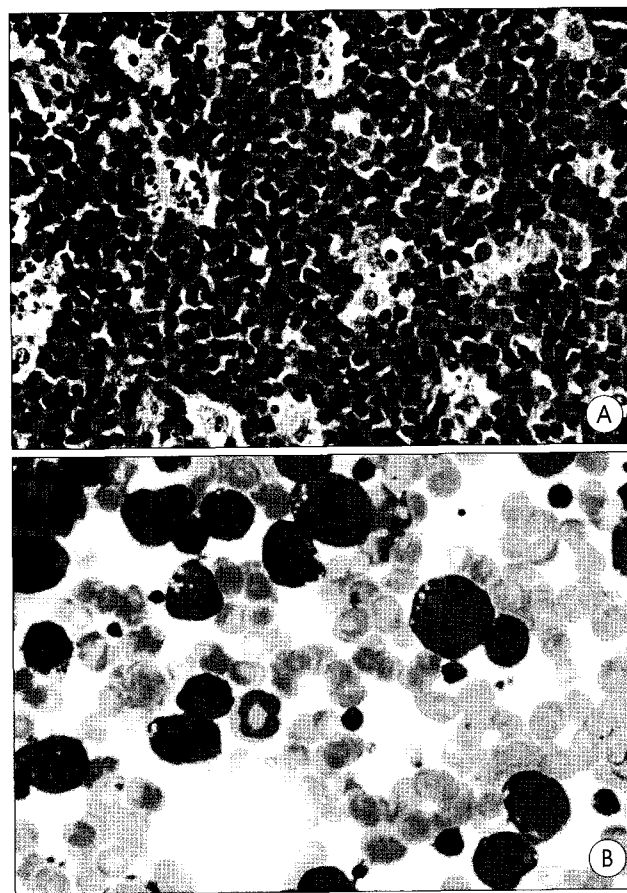


Fig. 5. A : Photomicrography of the surgical specimen shows hypercellular bone marrow replaced by homogenous population of lymphoid cells with cytological features of Burkitt's leukemia (H&E, original magnification ×400). B : Bone marrow smear shows the lymphoblasts contain deeply basophilic cytoplasm and abundant lipid vacuoles in the cytoplasm (Wright stain, ×1000).

treatment⁴. The initial surgery should be limited to biopsy for diagnosis when no other means (e.g. examination of ascites and pleural fluid, marrow, or cerebrospinal fluid) are available, there are acute abdominal complications, or complete removal of the localized disease that excludes mutilating surgery. There is no advantage in performing major tumor resection or debulking procedures. However, in the case of progressing neurologic deficit and vague diagnosis, surgical decompression and biopsy are recommended if possible on an emergency basis^{10,13,16}. Radiotherapy is no longer used⁴, it gives no advantage over chemotherapy and adds immediate and long-term toxicity to the treatment.

Conclusion

We present a case of someone who had CNS involvement of ALL-L3 as the initial clinical manifestation because of its clinical rarity. In the pediatric age group, if there is radiological involvement of CNS, then ALL should be considered in the differential diagnosis. If the lesion of cord

compression is definite and diagnosis is undetermined, surgical decompression and biopsy are necessary.

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