

# Cauda Equina Syndrome as a Rare Manifestation of Leukemia Relapse during Postallograft Period

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Here we report a 41-year-old woman with the diagnosis of acute myeloid leukemia. While being followed on remission after allogeneic peripheral blood stem cell transplantation, she developed systemic and central nervous system (CNS) relapse. CNS involvement presented first with meningeal irritation signs and then with cauda equina syndrome (CES). We define an interesting presentation of CES as abdominal pain and discuss the rare coexistence of the syndrome and leukemia under the light of the pertinent literature.

**Key words:** myeloid leukemia ■ cauda equina syndrome ■ posttransplantation

## INTRODUCTION

The cauda equina is formed by the nerve roots below the level of spinal cord termination. Cauda equina syndrome (CES) presents as low-back pain, usually bilateral sciatica; saddle sensory disturbances; bladder and/or bowel dysfunction; and variable lower-extremity sensory-motor loss. Common causes of the CES are trauma, lumbar disc disease, abscesses, spinal anesthesia, tumors (metastatic or primary) and advanced-stage ankylosing spondylitis. Some cases are idiopathic.

CES resulting in significant morbidity during the clinical course of leukemia is very rare. We present a patient with acute myeloid leukemia (AML) who developed CES as a manifestation of central nervous system (CNS) relapse five months after allogeneic peripheral blood stem cell (PBSC) transplantation.

## CASE REPORT

A 41-year-old woman was admitted to another hospital with complaints of fever and malaise. A complete blood count revealed a white blood cell count of  $40 \times 10^9/l$ . A diagnosis of AML (FAB-M4) was made after examination of a bone marrow aspirate. She then received one cycle of mitoxantrone and cytosine arabinoside “induction chemotherapy.” She subsequently presented to our emergency department with febrile neutropenia and was promptly hospitalized. A repeat bone marrow aspirate revealed that remission was not achieved, with an increase in myeloblasts (64%) and monocytic neoplastic elements (25%), compatible with AM<sub>4</sub>L. Remission induction chemotherapy with mitoxantrone and cytosine arabinoside was administered. After recovery of her blood counts, bone marrow examination revealed complete remission. She then received consolidation chemotherapy with high-dose cytosine arabinoside. PBSCs obtained from her “full match” sibling donor were transplanted.

On the 150th day posttransplantation, she presented to the emergency department with fever,

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malaise and weakness. Her blood count revealed a hemoglobin level of 8.9 g/dl, leukocyte count of  $1 \times 10^9/l$  and platelet count of  $10 \times 10^9/l$ . Peripheral blood smear revealed blasts constituting 80% of the white blood cells. The patient was lethargic with poor oral intake. The most remarkable findings on physical examination were a body temperature of  $40^\circ \text{C}$  and nuchal rigidity. Magnetic resonance imaging of the brain revealed contrast enhancement of the leptomeninges. Microscopic examination of the cerebrospinal fluid revealed a high white blood cell count, all blasts. Bone marrow aspiration was also compatible with AM4L relapse. She received an induction regimen consisting of mitoxantrone and cytosine arabinoside. Subsequently, she was given intrathecal cytosine arabinoside, methotrexate and dexamethasone. Craniospinal irradiation (CSI) was initiated. A week later, she developed severe abdominal pain. On palpation of the abdomen, there was generalized tenderness. Her white blood cell count being  $0.2 \times 10^9/l$ ; typhlitis was considered in the differential diagnosis. Abdominal computerized tomography (CT) scan showed nothing except for a massively enlarged urinary bladder. After urinary catheterization, 3.5 L of urine were obtained within two hours. Her abdominal pain decreased dramatically. She also complained of generalized weakness, loss of sensation in the lower extremities and fecal incontinence. Neurologic examination revealed sensory loss of light touch in the perineal area and lower extremities. There was remarkable muscle weakness in her lower extremities and deep tendon reflexes were diminished bilaterally as well. A thoracolumbar magnetic resonance (MR) scan demonstrated diffuse enhancement of the thickened cauda equina after contrast injection and clumped thickened nerve roots (Figure 1A and B). These findings were interpreted as leukemic infiltration of the cauda equina. CSI, intravenous dexamethasone and intrathecal cytosine arabinoside were continued. However, her disabling neurological symptoms failed to resolve, and persistent blastic cells were seen on cerebrospinal fluid examination. She developed neutropenic fever and, despite broad spectrum antibiotics, her clinical picture deteriorated. The patient preferred to leave the hospital rejecting further definitive or palliative treatment.

## DISCUSSION

Various primary and metastatic neoplasms, including the leukemias, may involve the spinal cord. In a review of 67 leukemia patients with spinal cord involvement, it was revealed that there was a more frequent association with AML.<sup>1</sup> The lumbar and sacral spines are affected in 34% and 23% of cases with leukemic spinal cord involvement, respectively.<sup>2</sup>

CES, however, is a rare type of spinal cord involvement and is all the more uncommon in leukemia patients. Since the symptoms may evolve gradually over time and patients may have varying intensities of symptoms, the diagnosis of CES may be very difficult. Loss or altered sensation between the legs, over the buttocks, back of legs, and inner thighs and feet, heels as well as numbness, weakness and pain in one or both legs may be seen. Twenty-seven percent of patients have disturbance of bladder or bowel function and urinary retention is the most commonly encountered entity among these.<sup>2</sup> Bladder dysfunction often presents earlier as difficulty in starting or stopping a stream of urine and empirical assessment via catheterization may be necessary.

The first and most remarkable finding of CES in our patient was abdominal pain. The possible link between her clinical picture and CES-associated bladder dysfunction was overlooked due to over-emphasis on typhlitis as the preliminary diagnosis until that abdominal CT showed a massively distended urinary bladder and MR scan documented leukemic involvement of the cauda equina. Recurrent lumbar puncture, as in our patient, may increase the risk of nerve fiber injury within the cauda equina, or it may be associated with hematoma compressing nerve roots. Intratecal forms of cytosine arabinoside or methotrexate have been reported to cause neurotoxicity, but the case was ventral polyradiculopathy presenting with lower extremity paraparesis and areflexia rather than a typical CES.<sup>3</sup> One case of transient CES has been reported among

**Figure 1. Forty-one-year-old female with leukemic infiltration of the cauda equina**

**A. Sagittal T1-weighted image after intravenous administration of gadolinium reveals diffuse enhancement of the thickened cauda equina.**



**B. Sagittal T2-weighted image of the lumbar spine shows clumped thickened nerve roots.**



47 children who underwent multiple intrathecal injections.<sup>4</sup> In our patient, CES was persistent, and leukemic infiltration of the cauda equina was clearly demonstrated by MRI.

In adult leukemias and malignant lymphomas, the incidence of meningeal disease was reported to be 20% for patients with AML.<sup>5</sup> Meningeal involvement in our patient was demonstrated by MR scan. In the literature, there is a very similar case of leptomeningeal leukemia masquerading as CES shown by MR scan.<sup>6</sup> On the other hand, CNS relapse after bone marrow transplantation for acute leukemia in first remission is uncommon.<sup>7</sup> Our patient was in first remission when allogeneic PBSC transplantation was performed. Although blasts on bone marrow examination were only documented after her initial presentation, she most likely had systemic relapse prior to CNS relapse. Isolated CNS relapse is extremely uncommon. Systemic relapse precedes CNS relapse by 4–207 days.<sup>7</sup> The manifestation as CES is very uncommon as a spinal complication of chloromas<sup>8,9</sup> and, within the context of posttransplant period, it has previously been reported only in a 65-year-old man with chronic myeloid leukemia.<sup>10</sup> Our case is interesting from this point of view.

CSI with or without intrathecal chemotherapy appears to be effective at eliminating leukemia in the craniospinal axis,<sup>11</sup> and CNS leukemia, if properly treated, probably does not shorten survival.<sup>12</sup> But the response of clinical AML meningeal leukemia to therapeutic radiation is not as successful as clinical ALL meningeal leukemia.<sup>13</sup> In a study, median survival after a diagnosis of CNS leukemia was eight and six months in ALL and AML, respectively.<sup>12</sup> Bone marrow failure due to hematologic relapse was the leading cause of death in this series.<sup>12</sup> Our patient's CNS leukemia displayed a refractory course. Although her CNS involvement predominated the clinical picture, her death would probably be caused mainly by bone marrow failure due to blastic infiltration.

In conclusion, we report a rare coexistence of CES with an unusual presentation and postallograft AML relapse. Urinary retention as a component of CES may be overlooked, and it can introduce itself as an acute abdomen-like clinical picture. Leukemic spinal cord involvement may manifest itself as CES during the postallograft period as well. Regarding the risk of CNS involvement in every leukemia patient who is not in remission, a very careful and routine neurologic examination and follow-up of related parameters such as urinary output could make the physician handle such clinical problems.

## REFERENCES

- Petursson SR, Boggs DR. Spinal cord involvement in leukemia: a review of the literature and a case of Ph1+ acute myeloid leukemia presenting with a conus medullaris syndrome. *Cancer*. 1981;47:346-350.
- Mostafavi H, Lennarson PJ, Traynelis VC. Granulocytic sarcoma of the spine. *Neurosurgery*. 2000;46:78-83.
- Anderson SC, Baquis GD, Jackson A, et al. Ventral polyradiculopathy with pediatric acute lymphocytic leukemia. *Muscle Nerve*. 2002;25:106-110.
- Keidan I, Bielorei B, Berkenstadt H, et al. Prospective evaluation of clinical and laboratory effects of intrathecal chemotherapy on children with acute leukemia. *J Pediatr Hematol Oncol*. 2005;27:307-310.
- Weizsaecker M, Koelmel HW. Meningeal involvement in leukemias and malignant lymphomas of adults: incidence, course of disease, and treatment for prevention. *Acta Neurol Scand*. 1979;60:363-370.
- Chim CS, Ooi CG. The irreplaceable image: leptomeningeal leukemia masquerading as cauda equina syndrome: appraisal by magnetic resonance imaging. *Haematologica*. 2001;86:1117.
- Singhal S, Powles R, Treleaven J, et al. Central nervous system relapse after bone marrow transplantation for acute leukemia in first remission. *Bone Marrow Transplant*. 1996;17:637-641.
- Sandhu GS, Ghufour K, Gonzalez-Garcia J, et al. Granulocytic sarcoma presenting as cauda equina syndrome. *Clin Neurol Neurosurg*. 1998;100:205-208.
- Vayopoulos G, Yataganas X, Konstantopoulos K, et al. Extramedullary blast crisis in chronic myelogenous leukemia presenting with manifestations of cauda equina syndrome. *Haematologica*. 1988;73:129-131.
- Dalton SR, Ririe DW, Neuhauser TS. Cauda equina syndrome in a 65-year-old man, status post-bone marrow transplant for chronic myeloid leukemia. *Arch Pathol Lab Med*. 2001;125:1385-1386.
- Sanders KE, Ha CS, Cortes-Franco JE, et al. The role of craniospinal irradiation in adults with a central nervous system recurrence of leukemia. *Cancer*. 2004;100:2176-2180.
- Brinch L, Evensen SA, Stavem P. Leukemia in the central nervous system. *Acta Med Scand*. 1988;224:173-178.
- Shapiro R, Gilbert H, Skeel RT, et al. The management of extramedullary disease in acute leukemia with therapeutic radiations. *Rev Interam Radiol*. 1977;2:191-197. ■

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