Subdural Hematoma during Allogeneic Bone Marrow Transplantation for Chronic Myelogenous Leukemia

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Chronic subdural hematoma has been reported as one of the complications of childhood acute lymphocytic leukemia (ALL), acute promyelocytic leukemia (APL) and chronic myelogenous leukemia (CML) in the blastic phase [1-4]. We report a case with CML who developed subdural hematoma during bone marrow transplantation (BMT).

A 24-year-old male was diagnosed as having Philadelphia-chromosome-positive CML in 1989. After having been treated with α interferon and hydroxyurea for 2 years, he underwent allogeneic BMT in June 1991 using busulfan and cyclophosphamide as a preparative regimen. The last preoperative bone marrow examination was performed on day -12 of BMT which revealed less than 2% of blasts and promyelocytes.

Intrathecal treatment with methotrexate and cytosine arabinoside was performed on day -11 of BMT with normal findings of cerebrospinal fluid. Phenytoin had also been used as prophylaxis for neurological toxicity of busulfan.

On the second day of busulfan, day -6 of BMT, he started to complain of headache on his forehead. Neurological examination was normal, and CT scanning of the whole brain performed on the same day did not show any abnormalities (fig. 1a).

His serum level of phenytoin was within normal limits, and so were the coagulation studies. Because his symptoms seemed to be subsiding, he underwent BMT as scheduled.

The post-BMT hospital course was unremarkable except for an episode of fever, which responded to antibiotics, and the exacerbating headache which restarted on day 1 without any history of head injury.

Multiple neurological examinations including the examinations of his optic fundi had been persistently normal. His platelet counts had been maintained above $20 \times 10^9/l$ during the whole course of the BMT, and the coagulation studies also remained normal. A repeated CT scan of the brain was obtained on day 17 after the engraftment of the bone marrow had been confirmed, which revealed bilateral diffuse subdural hematoma and brain edema (fig. 1b).

Because of the low platelet and the neutrophil counts, he was followed with medical treatment and then underwent a drainage operation of the bilateral subdural hematoma on day 34. His

postoperative course was unremarkable without any neurological defects, and repeated CT scans showed that no subdural effusion remained.

The pathological examination of the subdural fluid and the dura mater were negative for any abnormal cells or the pathogens.

Chronic subdural hematoma is one of the neurological complications of leukemia, especially childhood ALL and APL [1, 2]. Recently, the association with CML in lymphoid transformation was also noticed [3].

This is the first reported case of BMT complicated with subdural hematoma even though the etiology was not

a
b

Fig. 1. CT scan of brain obtained on day 6 (a) and day 17 (b), showing the subdural hematoma (arrow) developed in the meantime.

clear. The cytological findings of the cerebrospinal fluid just before and after the BMT and pathological findings of the dura mater were unremarkable. There was no history of head injury nor coagulation abnormalities.

Although there is no pathological evidence, because the patient was found to have bilateral subdural hematoma just after the BMT, we do believe that the procedures of BMT, especially intrathecal treatment, were at least partially responsible for the development of this complication. Thrombocytopenia itself cannot explain this because thrombocytopenia would develop acute and lethal subdural bleeding rather than bilateral chronic subdural hematoma. Also the platelet counts of the patient remained more than $20 \times 10^9/l$ during the procedure.

It is quite rare for a patient of this age with leukemia to develop subdural hematoma bilaterally without any spe-

cific reasons. Dural infiltration by leukemia cells may be an important factor in the pathogenesis of subdural hematoma in cases of ALL [1]. The lymphoid blasts of CML in the blastic phase may tend to infiltrate the meninges, and this might be responsible for the reported case with CML, too [3].

In the present case, the patient already might have had a leukemic infiltration in his meninges when he underwent BMT, even though there was no evidence suggesting that he had CML in the hematological blastic phase or that he had a meningeal involvement.

We should be aware of subdural hematoma as one of the neurological complications of BMT and should evaluate the patient with neurological complaints accordingly.

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