Bone Marrow Transplantation during the 1995 Hanshin Earthquake Disaster

People throughout the world have been experiencing many devastating earthquakes, especially within the last decade, and still face the threat of such disasters in the near future. At 5:46 AM, on January 17, 1995, the Hanshin region of Japan was hit by an earthquake of magnitude (M) 7.2 which killed 6,432 people and injured approximately 35,000. About 400,000 houses and buildings were damaged, and electricity, water, and city gas supply were suspended over a wide area (1). Our hospital (Hyogo College of Medicine Hospital, Nishinomiya), located at approximately 40 km northeast from the epicenter, was within the area of M 6-7 and was greatly damaged. We have two class 100 laminar-air flow rooms in which two patients were being isolated to receive bone marrow transplantation (BMT). We report our experience of managing BMT patients in such a disaster.

The laminar air flow rooms are located adjacent to each other with a preparation room on the 11th floor of our 13-story hospital. When the earthquake hit, the building was severely shaken and electricity and water supply stopped immediately. Parts of the inner walls and ceiling of the building fell. Racks, bookcases and steel cabinets toppled over and were damaged, while most movable racks and beds were dislodged by the shocks but not damaged. Fortunately, no fire occurred in the hospital, and no injuries were sustained by the 980 inpatients and 110 medical staff on duty that night. The emergency power supply was reestablished partially within several hours but was limited to service to ceiling lights. Air conditioning and water supply stopped for more than one month. Oil stoves were prohibited for fear of fire in spite of January being the coldest season in Japan. As the hospital could not function, approximately 600 of the 980 inpatients were transported to other hospitals in non-affected areas.

Case 1. A 43-year-old man with chronic myeloid leukemia (CML) in the accelerated phase had received transplantation from an human leucocyte antigen (HLA)-matched unrelated donor 4 days before the earthquake (Table 1). The patient was worried about the damage to the clean room but tried to remain calm. The leukocyte count after the earthquake remained near 100/μl, but no infection developed. After 3 days, we decided to start the administration of CY for 2 days. Six days after the earthquake, bone marrow cells were collected from her donor (one-locus HLA-mismatched father) under total anesthesia in the operation room on the fourth floor of our hospital, although the power supply had been recovered only partially. Fortunately, she had no other problems except anxiety and achieved successful engraftment 14 days after BMT.

It took 35 days for our hospital to return to its normal functioning status, and until then our clinical activities were extremely limited. Following the Hanshin Earthquake, there have been reports of increased incidence of myocardial infarction (3), peptic ulcer (4), pneumonia (5), elevated blood pressure in patients with hypertension (6) and impaired glycemic control in patients with diabetes mellitus (7) among inhabitants in the affected area. We have also observed differences in the bacterial and fungal species detected from the patients with hematological disorders admitted to our hospital before and after the earthquake (unpublished observation). It was difficult to estimate how the cleanliness changed after earthquake and how merely keeping away from the laminar air flow room could serve for prevention from infection. As BMT requires a multistep procedure, the earthquake had a great effect on our activities. However, despite severe damage and limited electricity and water supplies, we were able to conduct BMT in a conservative manner. We hope our experience can offer some helpful suggestions in the case of disaster.

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References
2) Fujimori Y, Kanamaru A, Hashimoto N, et al. Second transplantation with

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Disease</th>
<th>Donor</th>
<th>Preconditioning</th>
<th>Day*</th>
<th>WBC* (μl)</th>
<th>Fever*</th>
<th>Anxiety*</th>
<th>Outcome*</th>
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<tr>
<td>1</td>
<td>43</td>
<td>M</td>
<td>CML</td>
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<td>300</td>
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<td>2</td>
<td>21</td>
<td>F</td>
<td>MDS (RAEB-T)</td>
<td>father</td>
<td>TBI+Bu+CY+ATG</td>
<td>day -3</td>
<td>100</td>
<td>-</td>
<td>severe</td>
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CML: chronic myeloid leukemia, MDS: myelodysplastic syndrome, RAEB-T: refractory anemia with excess of blasts in transformation, Bu: busulfan, CY: cyclophosphamide, ATG: anti-thymocyte globulin, VP-16: etoposide. *BMT date in relation to the date of the earthquake. †White blood cell (WBC) count on or after the day of the earthquake. ‡Fever within two weeks of the earthquake. §Anxiety within two weeks of the earthquake. ¶Effect of the earthquake on BMT


