Mobilization of Hematopoietic Stem Cells for Use in Autologous Transplantation

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Autologous hematopoietic stem cell transplantation (HSCT) is a potentially curative therapeutic approach for a number of malignant hematologic and lymphoid diseases. The three types of HSCT are allogeneic, autologous, and syngeneic. In allogeneic transplantation, the hematopoietic stem cells (HSCs) are obtained from a human leukocyte antigen–matched sibling, an unrelated volunteer donor, or cryopreserved umbilical cord blood. In autologous HSCT, the HSCs are collected from the bone marrow or the blood of the patient when the cancer is in remission or a state of minimal residual disease. The third type of HCT is a syngeneic transplantation, where the source of the graft is an identical twin. Peripheral blood HSCs have largely replaced the use of bone marrow as the graft source for autologous HSCT. The benefits of using HSCs collected from the blood compared to HSCs collected from the bone marrow include a shorter period of neutropenia, which translates into reduced use of antibiotics, decreased risk of infection, shorter hospitalization, and reduced costs (Schmitz et al., 1996; Smith et al., 1997).

The focus of this article is the mobilization of HSCs for use in autologous HSCT. The term mobilization is used to describe the process by which HSCs are released from the bone marrow into the blood. The biology of HSCs and the mechanisms by which HSCs remain in the bone marrow microenvironment or are released into the blood will be reviewed. To date, the two principle means of mobilization are the use of cytokines alone or the use of cytokines in combination with chemotherapy. These mobilization strategies will be described. Strategies for individuals who do not collect a sufficient graft with current mobilization techniques will be reviewed, including the use of novel mobilization agents. The collection, processing, and cryopreservation of HSCs will be outlined.