

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 various malignant hematologic and lymphoid diseases. Hematopoietic stem cells (HSCs) may be collected from the blood or the bone marrow. HSCs are capable of self-renewal and give rise to progenitor cells, multipotent cells that differentiate and proliferate into the mature cells of the blood and immune system. HSCs and progenitor cells are released from the bone marrow into the peripheral blood through a process called mobilization. HSCs then are collected from the blood in a process called apheresis and cryopreserved for administration following the high-dose preparative regimen. This article reviews stem cell biology, current mobilization strategies, use of novel mobilization agents, and nursing care of patients during the mobilization phase of autologous HSCT. Understanding the biology and process of HSC mobilization is critical for transplantation nurses to deliver and coordinate care during this complex phase of autologous HSCT.

Autologous hematopoietic stem cell transplantation (HSCT) is a therapeutic approach that is potentially curative 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

At a Glance

- ◆ Mobilization of hematopoietic stem cells (HSCs) from the bone marrow into the peripheral blood is a multistep process involving the interplay among chemokines, cytokines, cell adhesion molecules, and the bone marrow microenvironment.
- ◆ The goal of stem cell collection is to mobilize a sufficient number of HSCs that are capable of regenerating the full hematopoietic lineages and to achieve adequate engraftment following autologous HSC transplantation.
- ◆ Nurses need to understand stem cell biology and the mechanisms of action of current mobilization strategies.

mobilization techniques will be reviewed, including the use of novel mobilization agents. The collection, processing, and cryopreservation of HSCs will be outlined.

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