Donor availability and improving safety & efficacy of stem cell transplantation.

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Introduction

Stem cell transplantation is a generic term covering several different techniques. For allogeneic transfers, hemopoietic stem microorganisms are taken from the bone marrow, peripheral blood, or umbilical string blood of a sound contributor matched for human leukocyte antigen type, who might be a relative or an inconsequential worker. For autologous transfers, stem cells are taken from patients' own bone marrow or peripheral blood [1].

Matched unrelated donors

To make transplantations accessible to a more prominent number of qualified patients, libraries of volunteer bone marrow contributors have been created. These can furnish relocate doctors with stem cells from irrelevant yet matched donors. In excess of 6 million donors are enrolled on public donor boards around the world.

Transplants from unrelated volunteers are associated with higher morbidity and mortality than those from matched siblings, but outcomes are improving, thanks in part to modern molecular techniques that allow donors and recipients to be more closely matched. Patients with chronic myeloid leukaemia who are considered a good risk for transplantation (aged 20-40 years, seronegative for cytomegalovirus, in chronic phase, and receive a transplant from a closely matched donor within 1 year of diagnosis) have outcomes similar to those seen in allogeneic transplants between siblings, with more than 70% survival at 5 years..

Patients with common human leukocyte antigen types have a better chance of matching than those with rarer human leukocyte antigen types, such as ethnic minorities or mixed parentage. It can take months to find, test, obtain consent from, and declare a suitable volunteer donor, and delays can be critical in patients with acute leukaemia. Their disease may relapse or progress before the search is completed, particularly if the search must be extended outside of their home country [2].

Stem cells from umbilical cord blood

Neonate cord blood contains a large number of hemopoietic stem cells, which can be harvested at birth, frozen, and then transplanted into patients who would not otherwise have a donor. 4 Thousands of such donations are now stored in special banks around the world after cell counts and virologic screening tests, and inventories of their human leukocyte antigen types are made available to transplantation centres. Computer records can be quickly scanned, and donations can be matched with potential recipients without the delays that come with finding an adult donor. The first successful cord blood transplant was performed in 1989, and since then, over 700 transplants have been performed. These transplants have a slightly delayed engraftment but a lower risk of graft-versus-host disease. Cord blood transplants are becoming more popular. [3].

Autologous transplantations

The most common type of stem cell transplantation is autologous transplantation, in which patients are their own donors. Cryopreservation techniques now allow bone marrow to be safely and indefinitely stored while the patient receives conditioning chemotherapy, with no catastrophic loss of stem cells upon thawing. Recovery of peripheral blood cell counts after transplantation of cryopreserved marrow previously exposed to chemotherapy was slow, and patients experienced prolonged neutropenia and thrombocytopenia. There was no graft-versus-host disease or prolonged immunosuppression, and the procedure was safer than allogeneic transplants [4].

It was discovered in the early 1980s that marrow stem cells circulated in the peripheral blood, in small numbers in normal controls but in greater numbers in patients recovering from chemotherapy-induced neutropenia. During the recovery period, the patient was given bone marrow growth factors such as granulocyte colony-stimulating factor, which increased stem cell yields even more. After treatment with the growth factor alone, a large number of stem cells were discovered in some patients. This technique can usually harvest enough cells from the peripheral blood in 2 to 3 days to safely perform an autologous transplantation. Patients who received this type of transplant experienced faster recovery of peripheral blood cell counts than those who received cryopreserved autologous bone marrow. Peripheral blood is now available [5].

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