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Evolution of Haematopoietic Stem Cell Transplantation in Gujarat - A Personal Journey through Three Decades

Haematopoietic Stem Cell Transplantation (HSCT) involves the intravenous infusion of hematopoietic stem cells in order to re-establish blood cell production in patients whose bone marrow or immune system is damaged or defective. This helps to augment bone marrow function and depending on the disease being treated, leads to either destruction of malignant tumor cells or to generation of functional cells that can replace the dysfunctional ones, as is the case of immune-deficiency syndromes, hemoglobinopathies, and other diseases. Since it was first used successfully in 1986, HSCT has become one of the most promising treatments for a number of serious illnesses. Over the past half century, this technique has been increasingly used to treat numerous malignant and nonmalignant diseases. The success of HSCT is influenced by a number of factors, including age of patient, general physical conditions, primary diagnosis, status of disease at the time of HSCT and type of donor, etc.

Stem cells

Cells for HSCT may be obtained from the patient himself or herself (autologous transplant) or from another person, such as a sibling or unrelated donor (allogeneic transplant) or an identical twin (syngeneic transplant). Cell sources include bone marrow; peripheral blood; umbilical cord blood; or, rarely, fetal liver.

Conditioning regimen

During the “count down” period, usually five to 10 days before the stem cell infusion, conditioning regimen is administered. The chemotherapeutic agents and/or radiotherapy that are used vary with the underlying disease. The overall goals of the conditioning regimen are to destroy any residual cancer cells in case of autologous transplant. In allogeneic transplant it additionally suppress the immune system so that the patient do not reject the new stem cells and make room in the bone marrow for the donor stem cells to grow.

Autologous bone marrow transplantation

The bone marrow products are collected from the patient and are reinfused after giving high dose chemotherapy to the patient. The advantages include no graft versus host disease (GVHD). The disadvantage is that the bone marrow products may contain abnormal cells that can cause relapse in the case of malignancy. Hence theoretically, this method cannot be used in all cases of abnormal bone marrow diseases. It is performed for stem cell rescue after high-dose chemotherapy in patients of multiple myeloma, Hodgkin disease, neuroblastoma, plasma cell disorders, etc.

Syngeneic bone marrow transplantation

The donor and the recipient are identical twins. The advantages include no GVHD and no graft failure. However, only a tiny number of transplant patients will have the ability to have an identical twin for transplantation.

Allogeneic transplantation

The donor is an HLA matched family member, unrelated matched donor or mismatched family donors (haploidentical). It is performed in conditions where replenishment of deficient or dysfunctional cells is required as in Thalassemia, Mucopolysaccharidosis, Aplastic anemia, Gauchers disease or to treat malignant conditions like acute leukemia, non-Hodgkin lymphoma.

Cord blood transplantation

The source of stem cells is umbilical cord blood. This procedure has not been in much use in India as its storage requirement are not cost effective for developing countries. Moreover, the present storage conditions and availability in India do not provide adequate yield of stem cells for successful transplant. Also improved outcome of haploidentical transplant has outweighed the requirement of cord blood transplantation.

HSCT at GCRI

GCRI began its glorious journey of HSCT under the guidance of Dr Sandeep Shah by performing first autologous transplant in the year 1999 in a patient of multiple myeloma.

The bone marrow transplant centre is a five bedded transplant centre. The institute takes pride in having performed more than 530 transplants over its journey of 23 years in transplant, of which 228 are autologous , 230 allogenic (including 48 haploidentical, and 7 matched unrelated donor transplant), and 17 cord blood transplant upto now.

GCRI holds to its credit, performing nations first umbilical stem cell transplantation in a child with thalassemia. Presently umbilical cord blood cell transplantation has fallen out of favour as it exhibits poor outcome in developing countries like India due to poor storage conditions and infrastructure. Additionally, the improving survival outcome of haploidentical autologous HSCT makes it more feasible and cost effective.

Strength / workload

Approximately 50 HSCT transplants a year and hematology OPD twice weekly for complex haematological disorders.

Area of Activity

GCRI excels in conducting HSCT. The centre gets patients from various states of India for autologous and allogeneic transplant for various benign and malignant conditions. Number of haploidentical transplants have increased over recent years for patients who don't have matched sibling donor and are not able to undergo matched unrelated donor transplant.

Bone marrow transplant unit at GCRI has a very high success rate and transplant related mortality (TRM) is comparable to any other institute in the world.