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Backgrounder – Stem cell transplantation

The bone marrow is located in the cavities of the bones. It contains thousands of stem cells from which billions of essential blood cells are formed every day. Very high doses of chemotherapy and/or radiotherapy – common treatments for a number of malignant blood diseases or other forms of cancer – will irreversibly damage the bone marrow. Because of this, the bone marrow cannot produce sufficient numbers of blood cells. Immunity decreases, and the body can no longer fight off infections effectively. In such cases a bone marrow or stem cell transplant offers a solution.

What is a stem cell transplant?

A stem cell transplant can be performed to treat a number of malignant blood diseases such as leukaemia and lymphoma, and other forms of cancer.

Stem cells can be collected in two ways:

1. From the bone marrow (aspirations from the pelvis). A transplant using these stem cells is known as a bone marrow transplant.
2. From the blood. This is called a stem cell transplant. This can only be done if the stem cell donor is treated with growth factors that cause stem cells – which normally remain in the bone marrow – to move to the blood in large numbers.

The patient receives healthy stem cells intravenously, i.e. injected directly into the bloodstream. These stem cells find their way to the bone marrow, and begin to produce new blood cells. This is essential for the patient's recovery.

Transplantation using donor stem cells or own stem cells

The stem cells used for a transplant can come from two sources:

1. A donor: this is known as allogeneic transplantation.
2. The patient: this is known as autologous transplantation.

Allogeneic transplantation

For some forms of blood cancer, transplanting donor stem cells has one important advantage. The donor's immune cells, which are also present in the transplant, will identify any remaining cancer cells in the patient's body as foreign and attempt to clear them out. If there is no donor available in the immediate family, a tissue match from a non-related donor may be sought at a donor bank. This form of transplantation is performed until the age of about 50 – 60 years, taking into account the patient's condition and the impact of the intervention. Thousands of patients undergo this type of treatment every year.

Autologous transplantation

In autologous transplants, the patient's own stem cells are used. This form of transplantation is performed up to the age of about 65 years, depending on the patient's physical condition.

Advantages of a stem cell transplant

There are two important advantages of stem cell transplants over bone marrow transplants: firstly, no anaesthesia is required, and secondly, blood cell production recovers more swiftly, leaving the patient vulnerable to infections for a shorter period of time.



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What complications are associated with stem cell transplants?

A complication that may arise after allogeneic stem cell transplantation is rejection of the stem cell transplant. If this occurs, the patient's immune system will be entirely depleted because his/her own immune cells were wiped out by the prior high-dose treatment, and the donor cells have been rejected. Without blood cell production, the patient is also at risk of spontaneous bleedings and serious anaemia: a life-threatening situation.

Another serious complication is the 'graft-versus-host' reaction. The donor tissue (graft) attacks the patient's (host) organs and tissues. The donor's immune cells identify the patient's organs and tissues as 'foreign' and attack them. This is also known as reverse rejection.

In some types of cancer, this graft-versus-host reaction can also be 'useful', because the reaction attacks the patient's tumour cells as well. In these cases, the occurrence of a graft-versus-host reaction increases the odds of the treatment being successful.