



Review Article

STEM CELL TRANSPLANTATION FOR THE TREATMENT OF CANCER: A REVIEW

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ABSTRACT

In the stem cell therapy for cancer treatment, along with radiation therapy, very high doses of chemo are applied for the destruction of the cancer cells. The stem cells are also killed in the bone marrow. After its destruction, the stem cells are administered in replacement of the cells which were destroyed. These stem cells are administered intravenously. As time proceeds, the stem cells settle in the bone marrow and start the initiation of buildup of new healthy cells.

Key words: Cancer, Stem cell, Treatment

INTRODUCTION

The autologous stem cell transplants are derived from the patient suffering from cancer. The stem cells are collected even before the initiation of the cancer treatment. These stem cells are then harvested from either the blood or bone marrow. After the patient receives an exposure to high doses of chemo and/or radiation therapy the stem cells are thawed and administered again in the patient. But still there remains a risk of "graft-versus-cancer" effect causing graft failure¹.

During an autologous transplant it may accidentally happen that cancer cells may be picked up along with the stem cells followed by its administration into the patient. For its prevention, the doctors now prescribe anti-cancer drugs or stem cell treatment for the reduction of cancer cells present, if any².

Tandem transplants

The phenomena by which two consecutive autologous transplants is performed in a row is known as *tandem transplant* or *double autologous transplant*. This is carried out by administration of the patient with two courses of high-dose chemo in which a transplant if made by the patients' self stem cells. In this technique, the double doses of chemo are administered within 6 months where the second dose is given after recovery from the first one. The required stem cells are harvested before the initial high-dose chemo treatment. From it, half of the obtained cells are used for each transplant.

For the treatment of multiple myeloma, tandem transplants are most often used in advanced cases of testicular cancer. The risk of

hazardous effect to human health is more in this type of transplantation as it involves two transplants³.

Allogeneic stem cell transplants

A donor system in which the stem cells closely resembles with the patient are the preferred donors of stem cells in allogeneic transplants. This is known as MUD (matched unrelated donor) transplant. However, the MUD carrying transplants are usually at a higher risk than those of a good match. The blood collected from the placenta and umbilical cord of newborns is a newer source of stem cells in allogeneic transplants. The number of stem cells present per unit of cord blood is lower in large adults, so this source of stem cells is limited to small adults and children⁴.

Advantages: The cancer cells that might remain present after high-dose treatment are destroyed by the donor stem cells which make their own immune cells.

Disadvantages: In the patient's body, the donor cells remain at the risk of destruction by the patient's body before settling in the bone marrow. There remains a risk for the immune cells from the donor to attack healthy cells in the patient's body. This is known as *graft-versus-host disease*. These infections prove to be quite fatal for the patient.

Allogeneic transplant is most often used for the treatment of aplastic anemia, myelodysplastic syndrome, certain types of leukemia and lymphomas.

Mini transplants (non-myeloablative transplants)

Mini-transplants are generally recommended by the specialists for the patients who due to their age or certain health conditions are riskier to perform any transplants. This procedure uses much lesser chemo and/or radiation exposure to the patient body. The principle followed is to kill some of the cancer cells along with the bone marrow and to suppress the immune system to allow the settling of the donor stem cells in the bone marrow.⁵

Mini-transplants are ineffective for the patients having lot of cancer in their body or those with fast-growing cancers. Mini-transplants are used for the treatment of multiple myeloma patients.⁶

Syngeneic stem cell transplants – for those with an identical sibling

When the patient has an identical sibling, this kind of special kind of allogeneic transplant is recommended. In this type of transplant the graft versus host disease is not produced.⁷

Half-matched transplants

This mechanism of transplantation is employed in case of children who do not have closely resembling family members. Here the parent acts as a donor. Half of the HLA factors matches perfectly, while typically does not match.^{7,8}

Stem cells is used to study early embryological developmental stages and in cell transfer therapies. Stem cells have also the potential for use in tissue repair and genesis.⁹ Stem cells effectively elicit the hematopoietic stem/progenitor cells (HSPC) and leukemia-initiating cells (LIC) which require CD44 for homing and survival.¹⁰

CONCLUSION

Allogeneic graft replacement or transplantation is used for the treatment of multiple myeloma, leukemias and lymphomas. It is also applied for the treatment of neuroblastoma, testicular cancer and certain neonatal carcinomas. This has also a wide scope in the treatment of systemic sclerosis, Crohn disease and systemic lupus

erythematosus. Stem cell research is opening newer dimensions in developmental biology studies and in regenerative medicine.

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