ABSTRACT

Nowadays stem cell transplants are preferred in the treatment of various diseases. Stem cell transplantation is used in children for the treatment of various diseases. It is a preferred method of treatment but may also have some complications. Nursing approach is very important in these children. This article was made as a review. There are sources of stem cells, pediatric diseases treated with hematopoietic stem cell transplantation, hematopoietic stem cell transplantation and nursing approach in this article. This article aims to provide information about the stem cell practices and nursing approach for children.

Key words: Children, Human Health, Nursing Approach, Stem Cell Practices

1. INTRODUCTION

The progress in the studies conducted for stem cell is promising (KANSU, 2005). Hematopoietic stem cell transplantation is often preferred for the patients with malign or benign diseases. Currently, there is a promising increase in the duration of long-term survival rate, thanks to improved transplantation methods (Karakukcu, 2014).

In the world the first stem cell transplantation was performed on a patient with aplastic anemia in 1939, but the procedure was not successful. The first bone narrow transplantation performed in Turkey took place in 1984 (Sun et. al., 2008). Stem cell transplantation was performed in the late 1960s, and it was initially regarded as the final treatment method. However, supportive treatment methods were developed, complications and indications were better determined, and an alternative treatment was provided for terminal diseases (Dilek et. al., 1998). This article aims to provide information about the stem cell practices and nursing approach for children.

2. STEM CELL

A stem cell is a cell that can regenerate to different cell types. Cells in organs such as the skin, liver, or muscular cells generate cells in their individual form upon cell division. In comparison, stem cells have no specific predetermined purpose: they can assume the form of different cells upon the signals. The genes in the nucleus determine the cell type to which the stem cells will transform themselves. Stem cells can also take the form of cells that are destroyed or defective (Yetim, 2006). Stem cells are divided into three groups by their differentiation skills: totipotent, multipotent, and pluripotent. Totipotent stem cells are the early-stage stem cells of the embryo that can take the form of all cells, including those outside the embryo and organs. Multipotent stem cells are advanced-stage cells that can transform into specific cell types such as bone or cartilage cells. Cord blood and mature stem cells are multipotent stem cells (Partovi et. al., 2016). Pluripotent stem cells cannot form a new type of individual cell, although they are the source for all somatic cells and tissues (Karakaya, 2013).
3. SOURCES OF STEM CELLS

3.1. Embryonic Stem Cells
The first cell is formed after a sperm and egg join. Totipotent stem cells in the early stages of an embryo are embryonic stem cells. These cells are formed by the embryos after in vitro fertilization or obtained from pregnancies that have been deliberately aborted. The outer layer of an embryo forms the placenta, and the cells of that embryo can form all organs and tissues (Kansu, 2005). Embryonic stem cell practices are performed at reproduction-related centers after obtaining permission from the patient who will receive treatment for infertility; women whose embryos that will not be transplanted to their own womb can also be used (Karakaya, 2013).

3.2. Mature Stem Cells
Bodies of adult people have marrow and cells in different organs that can metamorphose and reproduce themselves: these cells are called mature stem cells. When compared to the embryonic cells, mature stem cells metamorphose less. However, with different approaches, studies are being conducted on mature stem cells for use in repairing impaired organs and tissues and for the treatment of different cells. Moreover, certain ethical issues related to embryonic stem cells may be solved with the use of mature stem cells (Karakaya, 2013).

3.2.1. Bone Marrow
The stem cell that is used most in hematopoietic stem cell transplantation is from bone marrow in a procedure conducted under general anesthesia. For a successful bone marrow transplantation, a cell that has an at least 2 to 4 x 10^8/kg nucleus should be collected. There are procedures for increasing the amount of stem cells in adults, but the number of studies related to this procedure for children is limited (Yesilipek, 2013). The first human bone marrow transplantation attempt was performed by E. Donnall in 1957. However, the first successful bone marrow transplantation was performed at Minnesota University in 1968 (Karakaya, 2013).

3.2.2. Peripheral Blood
The stem cell source that has been widely used in the recent years is peripheral stem cells. The literature indicates that the transplantations from child donors are uncomplicated. The short duration for achieving the desired number of stem cells, fewer infectious problems, and shorter period of hospital stay is among the advantages of peripheral stem cell transplantation (Yesilipek, 2013). The first autologous peripheral blood hematopoietic cell transplantation in Turkey was performed in 1992 (Aksu et. al., 2005).

3.2.3. Cord Blood
Stem cells are collected from the person having a tissue-concordant leukocyte antigen, and then transplanted in the recipient. The stem cells collected from the healthy recipient are transplanted in the recipient following chemotherapy to kill malignant cells. Collected stem cells should undergo aphaeresis and be transplanted in the recipient at the same day via catheter without freezing (Sun et. al., 2008). The limited number of cord blood cells having a nucleus limits the use of cord blood. This low number of cells is increased by a peripheral blood stem cell transplantation that is performed simultaneously with the cord blood transplantation from the donor (Yesilipek, 2013).

4. PEDIATRIC DISEASES TREATED WITH HEMATOPOIETIC STEM CELL TRANSPLANTATION

 Relevant literature reports that acute myeloblastic leukemia, acute lymphoblastic leukemia, chronic myeloid leukemia, lymphoma, myelodysplastic syndrome, hemophagocytic lymphohistiocytosis, primary immunodeficiency, acquired severe aplastic anemia, hereditary bone marrow deficiency syndromes, hemoglobinopathies, metabolic diseases, and solid tumors have been defined as indications for pediatric cell transplantation by the European Society for Blood and Marrow Transplantation (EBMT) (Yesilipek, 2013).
5. HEMATOPOIETIC STEM CELL TRANSPLANTATION COMPLICATIONS

Complications seen in hematopoietic stem cell transplantations differ by factors such as disease stage, patient’s age, tissue compatibility between the recipient, and donor and stem cell source (Sun et. al., 2008). These problems that affect patients’ long-term living conditions are especially important for children and adolescents who still have many years of life ahead of them (Nar, 2014). Complications that are based on the source and pre-transplantation practices such as infections, graft versus host disease, secondary malign diseases, renal failure, growth failure, infertility, gastrointestinal effects, pulmonary complications, and cataract may be seen in the patients who will undergo stem cell transplantation (Erdemir et. al., 2013).

Graft versus host disease may occur if the donor’s T cells do not comply with the recipient's antigens. This condition is designated acute (aGVHD) if it emerges by 100 days after the transplantation and chronic (kGVHD) if it emerges after the 100th day. It is seen more frequently in stem cell transplantations performed with peripheral blood, but it is less frequent in the transplantations conducted with cord blood. Older recipients and donors, gender differences, intense preparation regime, and the existence of malign disease increase the risk of graft versus host emergence. The treatment is deemed important because the existing disease period is unpleasant. The early response to the steroid treatment is important; otherwise, the patient should be evaluated for immunosuppressive treatment. However, the complications of immunosuppressive treatment should be considered (Yesilipek, 2013). Infection is one of the important causes of mortality and morbidity in stem cell transplantations. The possibility of infection increases with the preparation regime performed before transplantation. The immunosuppressive treatment method that is used to prevent GVHD causes acquired immunodeficiency, and patient becomes more susceptible to bacterial and fungal infections. The neutropenia that occurs during a fungal infection, which is the most significant reason for mortality, has been shortened using improved peripheral stem cell practices in which patients are administered antifungal prophylaxis. Viral infections are also among the important reasons for morbidity; preventive methods against viral infection are now used at stem cell transplantation centers (Sun et. al., 2008). The most severe complication seen after the hematopoietic stem cell transplantation is secondary cancer, which may occur following the preparation regimes performed before the transplantation and chemotherapy sessions. Certain cancer types may be present for ten years following the transplantation. Brain tumors, thyroid and breast cancer, and solid organ tumors may occur in children receiving cranial radiation, and leukemia may occur in the 2.5 years following transplantation (Karakukcu, 2014).

6. NURSING APPROACH

Hematopoietic stem cell transplantation and the chemotherapy administered following the procedure may in some cases cause psychosocial, mental, and physical problems. Thus, the problems that may occur before and after the hematopoietic stem cell transplantation should be considered. Nurses and other healthcare staff should evaluate the mental, social, and physical status of patients pre-transplant. This will increase patients’ ability to adapt to their diseases, and the possibility of depression and other behavioral problems will decline.

Isolation, washing hands, using masks, sterile aprons, and prophylactic antibiotics, and checking information about exposure to infection may help to reduce infection risk. Infection risk remains present following the hematopoietic stem cell transplantation. Thus, providing discharge-related education is quite important. This education should be included in the discharge plan as it relates to the patients’ living conditions. The patients and their relatives should be informed about certain topics by the nurse, such as having a clean house, plants in the home, personal hygiene, social environment, sexual life, pets and animal shelters, and vaccines to protect the patients against infections (Sun et. al., 2008). Schedules should be prepared for the medicines to be used by the patients, and no medicines other than these should be used. The families or caregivers should be informed about certain procedures such as the blood tests that will be performed to monitor the progress of children. Both the persons that will look after the children and the children should be informed about GVHD and infection symptoms and told that they should report these to a healthcare institution whenever these symptoms are present. Families should be told to apply to relevant institutions to ensure that children's education is not interrupted. Children will not be able to go to school for a few months after the transplantation, and this should be reported to the school. School nurses and other school personnel should be informed about the stem cell transplantation.
team, and their questions should be answered. The families can be supported by their friends and social service institutions (Ellen and Mary, 2007).

As a result hematopoietic stem cell transplantation practices, which are now being implemented more frequently, are completed successfully with the supportive treatment approaches that have been developed. However, hematopoietic stem cell transplantations are not completed just by a successful transplantation procedure: complication may occur that could lead to death. Thus, the process is quite demanding, both for the patients and their families. Nurses should inform the patients and their relatives about the severity of this process at discharge.

REFERENCES