The Assessment of Bone Marrow Recovery of Autologous Stem Cell Transplantation

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Background: Hematopoietic stem cells contain CD34+ antigen on the surface, which is capable of self-renewal and the formation of mature blood cells. The cell is isolated from bone marrow and peripheral blood, and the amount is determined by flow cytometry. Lymphoid malignancies are the most suitable diseases of autologous peripheral blood stem cell transplantation. After transplantation, CD34+ stem cell number, granulocyte colony-stimulating factor usage, bone marrow recovery, post-transplant infection complications, and overall survival are compared. Since the launch of the bone marrow transplant project in Mongolia in 2011, The Center for Hematology and Bone Marrow Transplantation of The State Central Hospital has successfully performed autologous peripheral blood stem cell transplantation in 24 cases.

Materials and Method: The study was conducted using a retrospective cohort study based on clinical cases from February 2014 to September 2020 and involved a total of twenty-three patients who underwent autologous transplantation due to lymphoid malignancies which is Hodgkin’s lymphoma, Non-Hodgkin’s lymphoma, Multiple Myeloma. We used various condition regimens high dose melphalan for multiple myeloma, mitoxantrone-melphalan based regimen for lymphoma. Mobilized peripheral blood stem cells were harvested from all the patients. The apheresis repeated until the number of CD34+ stem cells reached the optimal level (>2*10^6/L). Engraftment was defined as absolute neutrophil count >0.5×10^9/L for 3 consecutive days or >1*10^9/L for 1 day in peripheral blood from the date of CD34+ stem cell infusion and platelet recovery was estimated to be >20×10^9/L for 3 consecutive days.

Results: Non-Hodgkin’s lymphoma was the most common indication (n = 11, 47.8%) followed by Multiple myeloma (n = 8, 34.7%), Hodgkin’s disease (n = 4, 17.5%). The mean age of the participants was 41.8 ± 14.2 years (range 19-64), 14 men, 9 women. The median numbers of CD34+ cells were 5.21×10^6 cells/kg (range 1.87-13.7×10^6 cells/kg). The median time to neutrophil recovery was 12.8 ± 2.1 days (range, 10–18), platelet recovery was 14.4 ± 5.6 days (range, 8–30). We divided patients in three groups by harvested CD34+ stem cell counts 2-4×10^6 cells/kg (n=10), 4-6×10^6 cells/kg (n=6), >6×10^6 cells/kg (n=7). Neutrophil engraftment was 2-4×10^6 cells/kg, 4-6×10^6 cells/kg, >6×10^6 cells/kg the median time to neutrophil recovery was 14.2, 12, and 11.2 days, platelet recovery was 18.3, 12, and 11.8 days, respectively. A statistically significant relationship was observed between the number of transplanted CD34+ stem cells and neutrophil, platelet recovery (p = 0.03, p=0.03).

Conclusion: 1. A sufficient number of CD34+ peripheral blood stem cells (5.21×10^6 cells/kg) was harvested using apheresis.
2. Neutrophil recovery was determined on 12.4 days in patients with Lymphoma, on 12 days in patients with Multiple myeloma, platelet recovery was 14.7, on day 13.8, respectively.
3. There is a linear correlation between CD34+ stem cell count with neutrophil and platelet recovery.
4. The number of CD34+ cells decreased with an increase in the number of chemotherapy regimens and the number of apheresis procedures (p = 0.01).

Keywords: Autologous hematopoietic stem cell, Lymphoma, Myeloma