

Abstract: P1302

Title: IMPACT OF INSUFFICIENT TOTAL NUCLEATED CELL COUNT ON BONE MARROW TRANSPLANTATION

Abstract Type: Poster Presentation

Topic: Stem cell transplantation - Clinical

Background:

In Japan, bone marrow grafting remains an important source of stem cells, accounting for 17% of hematopoietic stem cell transplantations from related donors and 74% from unrelated donors in 2021. Although it has been reported that the total nucleated cell count (TNC) of a bone marrow graft is one of the major prognostic factors in bone marrow transplantation, it has not been adequately validated for bone marrow transplantations with insufficient TNC.

Aims:

This retrospective study aimed to determine the impact of insufficient TNC on post-transplant prognoses.

Methods:

This study was approved by the Japanese Data Center for Hematopoietic Cell Transplantation (JDCHCT) and the institutional review board of Osaka University. We defined insufficient TNC as $TNC < 2.0 \times 10^8$ cells/kg, in accordance with the EBMT handbook. From the Japanese registry of stem cell transplantation (Transplant Registry Unified Management Program 2; TRUMP2), we selected adult patients who underwent first-time allogeneic bone marrow transplantations between 2014 and 2019 from the Japanese Marrow Donor Program (JMDP). A total of 1,463 patients with TNC levels of $< 2.0 \times 10^8$ cells/kg were included in the analysis, alongside 4,194 patients with TNC levels of $\geq 2.0 \times 10^8$ cells/kg as a reference group. The low TNC group was characterized by higher body mass indexes (BMIs), more human leukocyte antigen (HLA)-mismatched donors, and more female-to-male transplantations.

Results:

We demonstrated the negative impact of $TNC < 1.0$ on patient prognoses following bone marrow transplantation. Patients with $TNC < 1.0$ had significantly lower survival rates than those with higher TNC (the 2-year overall survival was 40.7% in patients with TNC levels of < 1.0 , 57.0% in those with $1.0 \leq TNC < 1.5$, 61.3% in those with $1.5 \leq TNC < 2.0$, and 62.3% in those with $TNC \geq 2.0$). $TNC < 1.0$ was found to be an independent factor predicting poor prognoses, via multivariate analysis. Patients with insufficient TNC tended to have delayed neutrophil, red blood cell, and platelet engraftments. A higher number of patients with $TNC < 1.0$ died from infections or bleeding than those in the other TNC categories. Moreover, patients across all TNC categories, including the reference group who did not achieve engraftment by day 21 or day 28, had significantly poorer prognoses. Approximately 75% of the patients with $TNC < 2.0$ who had not achieved engraftment by day 28 did eventually achieve it. However, patients with $TNC < 2.0$ who had not achieved engraftment by day 35 had a low rate of engraftment (44.9%) or re-transplantation (18.4%) and a high mortality rate (36.7%) later on.

Summary/Conclusion:

We demonstrated that $TNC < 1.0 \times 10^8$ is an independent factor associated with poorer prognoses, including more deaths related to infection and bleeding, even with successful engraftment. Moreover, $1.0 \leq TNC < 2.0 \times 10^8$ alone is not a prognostic factor; however, it may relate to a poor prognosis in cases that have not achieved engraftment by day 21–28. Since the subsequent mortality rates may increase over day 35, re-transplantation could be a treatment option, with careful consideration of the need for intervention and optimal timing. Further investigations are warranted to overcome the negative effect of insufficient TNC.

Keywords: Bone marrow transplant